



# Pay-Buy-Mobile

Business Opportunity  
Public White Paper Analysis



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# Pay-Buy-Mobile Business Opportunity Analysis – Public White Paper

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## 1. Executive summary

Pay-Buy-Mobile is a Mobile Network Operator (MNO)-led, GSMA initiative, for using mobile phones to make fast, secure payments in a retail environment using Near Field Communications (NFC)/contactless technology. The secure element recommended by the GSMA for the payment application in the mobile phone is the Universal Integrated Circuit Card (UICC), commonly known as the SIM card.

The UICC can be divided into security domains thus allowing third-party service providers the ability to manage and operate the services independent of the MNO. The UICC securely stores the subscriber identity. UICCs have rapidly become ever more sophisticated, containing enhanced processing power, much increased memory and extended security management functionality. The UICC offers an ideal environment, therefore, into which the Pay-Buy-Mobile application could be installed. This document focuses on credit and debit card applications hosted on the UICC in the mobile phone.

Thirty four of the world's largest MNOs (KTF, AT&T, China Mobile Communications Corporation, Chunghwa Telecom, Far EasTone, Kall, KPN, Maxis, MCI, Meteor, Mobikom Austria, Mobitel d.d., MTN, NTT DoCoMo, O2, Orange, Pelephone, Partner/Orange, Rogers, SFR, Singtel, SK Telecom, SMART, Softbank, Starhub, Telenor, TeliaSonera, Telecom Italia, Telstra, Turkcell, Vimpelcom, Vodafone, Wind) serving more than 1.3 billion customers have been working together on the Pay-Buy-Mobile initiative, to create and define a global approach to enable NFC payment services on mobile phones. Furthermore, the initiative aims to provide a common MNO viewpoint, which is key to enabling the development of a new market and to prevent market fragmentation.

Several recent trials around the world show early signs of the success of mobile NFC payments services and rapid customer take-up for services similar to Pay-Buy-Mobile. These trials have concluded that there is great customer demand and anticipation of NFC M-Payment services and that the technology can meet the high expectations of customers for simplicity and convenience. The technology is quickly understood and its usage readily adopted by the customer. The trials even suggest that a higher volume of 'impulse' transactions will be encouraged.

The Pay-Buy-Mobile initiative provides the financial and mobile industry with a clear pathway to a successful mobile NFC payment service. The initiative brings together the mobile operator, the financial institutions and the traditional payment networks. The opportunity now exists to provide a successful new service for banks' and MNOs' customers using the mobile device as a new payment form factor.

With the completion of the required standards anticipated in 2007 and the availability of UICC-based NFC-enabled handsets in 2008, it is expected that NFC M-Payment services will start to be realised in several regions around the globe in the 2008 timeframe.

A new role of Trusted Service Manager (TSM) is introduced to the Pay-Buy-Mobile ecosystem as a link between the Card Issuing Bank (CIB) and the MNO. It not only links a single CIB and a single MNO, but should be an integrated point of linkage between multiple CIBs and multiple MNOs. Depending on the placement of this role, various types of Pay-Buy-Mobile business models are possible.

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Four principal TSM business models have been identified, namely:

1. The MNO-centric model – in which the MNO performs the TSM role
2. The Independent entity model – in which a trusted third party performs the TSM role
3. The CIB-centric model – in which the CIB performs the TSM role
4. The Combination model – a combination of two or three of the above models, depending on the domestic market environment

Finally, the next steps for the Pay-Buy-Mobile initiative are identified:

- Publicity for the Pay-Buy-Mobile initiative is expanded in order to begin to raise the profile of the capability with the general public and make prospective stakeholders aware of its value.
- The MNO community engages with the financial institutions to build mutually acceptable models and implement an efficient ecosystem.
- Eleven operators select the business model appropriate for their market and execute trials, and through these trials will demonstrate the validity of the technical solutions and commercial frameworks, whilst determining customer behaviour jointly with the payment solution companies and card issuing banks.
- An analysis is carried out on the outcomes of the trials to identify potential requirements/ enhancements that need to be addressed as well as aspects that require further standardisation.
- The GSMA to lead standardisation activities to consolidate a common set of requirements and specifications.

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## 2. Background

Founded in 1987, GSMA is a global trade association representing over 700 GSM mobile phone operators across 218 countries of the world. In addition, more than 200 manufacturers and suppliers support the Association's initiatives as associate members.

The primary goals of the GSMA are to ensure mobile phones and wireless services work globally and are easily accessible, enhancing their value to individual customers and national economies, while creating new business opportunities for operators and their suppliers. The Association's members serve more than 2 billion customers – over 82% of the world's mobile phone users.

Pay-Buy-Mobile is a Mobile Network Operator (MNO)-led, GSMA initiative, for using mobile phones as a new form factor to make fast, secure payments in a retail environment using contactless technology. Pay-Buy-Mobile will not, necessarily, be the name of the service.

The initiative recommends that the secure element of the mobile phone be the Universal Integrated Circuit Card (UICC), commonly known as the SIM card (although other architectures exist and have already been deployed.). The UICC can be divided into security domains thus allowing third-party service providers to manage and operate their services independent of the MNO. The UICC securely stores the subscriber identity. UICCs have rapidly become ever more sophisticated, containing enhanced processing power, much increased memory and extended security management functionality. The UICC offers an ideal environment, therefore, into which the Pay-Buy-Mobile application could be installed. This document focuses on credit and debit card applications hosted on the UICC in the NFC-enabled mobile phone.

The project is a part of the GSMA's wider NFC initiative, which aims to exploit next-generation contactless technology to provide a variety of mobile services including access to public transport and sports stadia as well as financial services. An initial technical framework preceded the Pay-Buy-Mobile initiative (see section 9 for documents produced by this framework). Figure 1 illustrates the scope and overlap of the two projects.

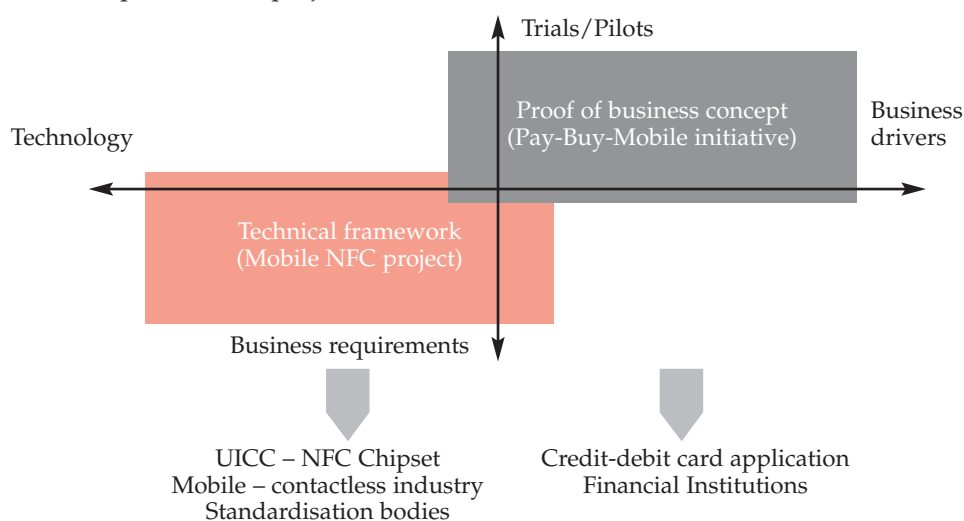


Figure 1 : GSMA workstreams on mobile NFC

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Pay-Buy-Mobile is receiving considerable attention from all Mobile Network Operators (MNOs) and service providers (such as the Card Issuing Banks (CIBs) and the payment solution companies) due to the potential opportunities that such a service could bring.

The GSMA believes that the technology and high-level business models are now ready and that Pay-Buy-Mobile will, with the help of the financial services and mobile industries, help to develop schemes to stimulate new revenue opportunities alongside existing payment form factors, including credit cards.

The stakeholders involved with Pay-Buy-Mobile will form a set of interdependent business relationships comprising the Pay-Buy-Mobile ecosystem. The primary stakeholders will be: banks (both existing card-issuing and acquirer banks), credit card-issuing companies, MNOs, retail merchants and customers. The GSMA will be neither commercially nor operationally involved with Pay-Buy-Mobile-type services. The role of the GSMA is to facilitate and promote the Pay-Buy-Mobile initiative.

This white paper sets out the GSMA's vision for the Pay-Buy-Mobile ecosystem, customers' expectations of the service, the business models that are likely to be successful and a roadmap towards the implementation of the service.

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## 3. NFC M-Payment services

### 3.1 Introduction

The past decade has seen steady development of mobile services, starting with basic mobile communication such as voice and short messages, leading to the extension of these services to mobile multi-media messaging, mobile TV and mobile Internet. Expanding this range of services to contactless services is seen as a natural next step by customers as well as by third party Service Providers and Mobile Network Operators (MNOs).

Contactless smart card technology is typically used in transport and building access applications, as well as holding medical data. Several varieties of contactless technology exist today: of most interest to Mobile Network Operators and to third party service providers is Near Field Communication (NFC) technology. NFC is designed to operate over very short distances, typically less than 4 cm, and is foreseen as a strong enabler to meet new customer needs for emerging services and drive value-added business models.

Contactless technology provides an intuitive and easy method for users to access services, as demonstrated by the rapid deployment of contactless public transport systems globally with many users. The technology has also been identified as a key sector for payment solutions, with the financial industry actively driving forward contactless payment.

Mobile NFC, the combination of contactless services based on NFC technology with mobile telephony including a hardware-based secure identity token (the UICC), offers substantial advantages over basic contactless smart card technology, including: peer-to-peer communications; high-speed two-way communications; and access to facilities on the mobile phone, such as the screen, communications link, keyboard, memory and processing power. This opens up the possibility of more complex and interactive applications, as well as the ability to modify applications on the phone via the communications link, for example, to download software or disable functionality.

Among a wide range of contactless services, NFC M-Payment services are the most eagerly anticipated. Customer feedback from usage of contactless mobile payment services, and trials and surveys conducted throughout the world, show that there is a strong desire for mobile phone users to enhance the capabilities of their mobile phone to perform more than just voice/multi-media communication. MasterCard found that '...more than 25% of participants who used their PayPass card 2 to 3 times a month prior to the trial program increased their frequency of usage to more than 3 times a month after experiencing MasterCard Mobile with PayPass'<sup>1</sup>. Furthermore, according to contactless card trials carried out by Visa, merchants have seen an increase in spending, and customers on the trials enjoyed the speed and convenience of not having to sign for purchases and to simply swipe their phone to make their purchase.

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## 3.2 Trials and research

Several recent trials around the world show early signs of the success of mobile NFC payments services and rapid customer take-up for services similar to NFC M-Payment, for example:

- Netherlands (Amsterdam) – Including: KPN, JCB, Nokia – mobile payment trial started Q4 2006
- SFR/MC/Credit Mutuel, including also Sagem, LG, Gemalto, Inside Contactless and Sagem Monotel. Face-to-face payment at several selected point of sales (>70), ranging from small shops to supermarkets. Already 100 customers are using Sagem phones (MY 700X contactless) with 200 more to join for a second phase beginning June 12th with LG phone (L600V contactless). Forecasted duration: February 2007 to October 2007
- Austria (Hagenberg/Upper Austria) - NFC trials including Mobilkom Austria, the University of Applied Science Of Hagenberg, Voestalpine and NXP. Campus access, payment at canteens and vending machines, peer-to-peer information services - November 2006 to June 2007
- USA (Atlanta, Georgia) – First North American NFC mobile phone payment trial by Cingular Wireless (AT&T) involving Nokia, Chase bank, ViVotech, Visa USA and the Atlanta Philips Arena; Dec 2005 to Sept 2006
- Korea:
  - Integrated Circuit (IC)-Card type: Contactless “IC-Card” M-Payment service involving KTF, SKT, Samsung Card and MasterCard was commercially launched in March 2006. The IC-Card service was further extended to other local SPs including ShinHan Card, KB Card and Hyundai Card based on Visa payWave
  - UICC type: SKT (May 2007) and KTF (June 2007) with LG Card and Visa commercially launched contactless UICC-based M-payment services using Over-The-Air (OTA) download of credit card account information onto user’s UICC in the handset

These trials have concluded that there is great customer demand and anticipation of NFC M-Payment services and that the technology can meet the high expectations of customers for simplicity and convenience. The technology is quickly understood and its usage readily adopted by the customer. The trials even suggest that a higher volume of ‘impulse’ transactions will be encouraged.

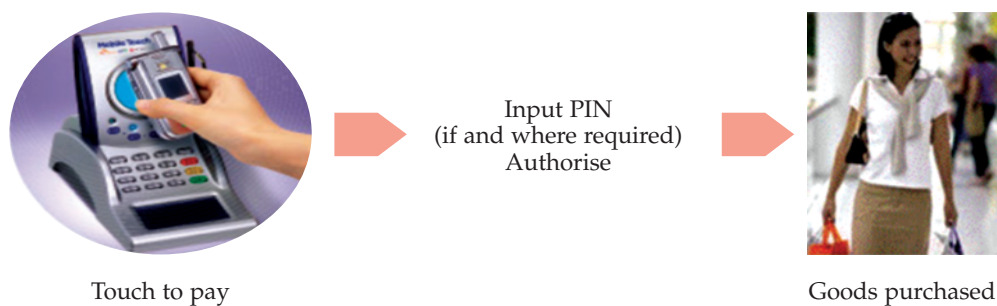
Strategy Analytics<sup>2</sup> forecasts that mobile phone based contactless payments will facilitate over \$36 billion of worldwide consumer spending by 2011.

More widely, consumers’ daily routines require the use of an ever increasing number of plastic cards, keys, tickets and cash. Having the possibility to combine these applications into a single mobile device will bring still greater convenience to the customer.

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## 3.3 Customer experience

The customer experience of Pay-Buy-Mobile can be illustrated as follows:



**Figure 2 : Pay-Buy-Mobile customer experience**

A customer can request his/her mobile phone be enabled by a variety of methods including the Internet, call centre or directly with their CIB. He/she enters a shop with the phone that has subsequently had its UICC provisioned with a multiple set of Pay-Buy-Mobile applications corresponding to different CIBs. After the goods/products are selected, the customer goes to the checkout counter to pay. The customer takes his/her mobile phone, selects the appropriate application (if multi-equipped) and “touches” it against the POS-terminal. He/she may then be required to enter their PIN (either into the phone or the POS terminal), and potentially touch it a second time against the terminal. The infrastructure completes the transaction, largely using existing contactless infrastructure and transaction processes, and once it is complete, if applicable, other transactions (like loyalty points) are processed. The details of the transaction process will vary from implementation to implementation.

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## 3.4 UICC solution

UICCs have become ever more sophisticated, containing enhanced processing power, much increased memory and extended security management functionality. The UICC offers an ideal environment, therefore, into which the Pay-Buy-Mobile application could be installed.

MNOs promote and recommend the UICC as the most appropriate Pay-Buy-Mobile Secure Element (SE) in mobile phones, because it offers many unique advantages for the customer, including:

- **Security:** the UICC is a tamper resistant secure element that conforms to industry security standards including the latest Global Platform security specifications.
- **Universal deployment:** universally available in subscribers' mobile phones, as standard.
- **Portability:** allowing customers to transfer their service settings between mobile phone because it is configured on the UICC/SIM.
- **Remote management:** allowing the applications and data on the UICC to be modified over the air cost effectively and accelerated responsiveness.
- **Standards based solution:** the UICC solution is based on internationally agreed specifications including those from the ETSI Smart Card Platform (ETSI-SCP) and the Global Platform standard.
- **Long operational lifecycle:** UICC designs change slowly, on a much longer timescale than mobile phones, which can be replaced in as short as one year. The UICC will therefore be compatible with future phones for some time, thereby reducing operational and replacement costs.

Advancements in Integrated Chip (IC) technology permit the partitioning of the UICC into several security domains (SD). The SD structure as shown in Figure 3 is emerging as a solution to provide a secure environment for hosting applications provided by multiple 3rd parties, e.g. various CIBs, where the UICC space is securely shared between them.

This allows the UICC owner: the MNO, as well as 3rd parties such as Card Issuing Banks, to maintain the needed confidentiality of their data and applications and protect them from access by other 3rd parties. This SD concept allows the MNO's (U)SIM application to reside in parallel with different CIB applications on one UICC. Each application is stored in its own SD, with neither the MNO nor the CIBs having the possibility to access each other's application and data.

The Issuer Security Domain (ISD) is the first application installed on a UICC, and establishes supplementary security domains for service providers. It is assumed that the keys to each SD will be forwarded to the 3rd parties (i.e. TSMs or CIBs respectively) and can then be subsequently reset by the 3rd party to establish privacy.

The specific implementation of the SD model is likely to vary on a country-by-country/regional basis, depending upon national market circumstances and requirements.

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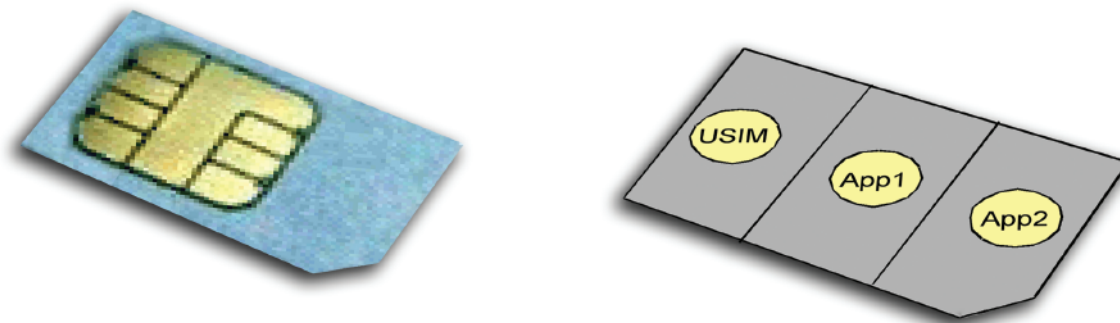


Figure 3 : UICC security domains

## 3.5 Customer offering

Pay-Buy-Mobile will offer customers:

- Ease of use: brought about by a straightforward user interface;
- Portability of the Contactless Applications: ensuring continuity of service when Customers' make handset changes;
- Global use – wide acceptance: large numbers of merchants/locations need to be equipped. Interoperability with contactless smart card POS terminals will facilitate the rapid roll out of Pay-Buy-Mobile;
- Multi-applications: ability to support several payment applications, delivered by multiple banks and/or payment solutions companies (Visa, MasterCard, JCB etc.);
- Security: based on the secure functionality contained in the UICC, augmented by the potential for OTA service disablement.

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## 4. Proposition

### 4.1 Introduction

The Pay-Buy-Mobile initiative provides the financial and mobile industry with a clear pathway to a successful mobile NFC payment service. The initiative brings together the mobile operator, the financial institutions and the traditional payment networks. The opportunity now exists to provide a successful new service for banks' and MNOs' customers using the mobile device as a new payment form factor.

Taking the plastic credit and debit card and extending it to the mobile device will require a collaborative effort on the part of the ecosystem members. The GSMA on behalf of the Mobile Network Operators has proposed several possible business models highlighted in this paper which incorporates the roles of the Trusted Service Manager and the Mobile Operators. The TSM will provide a central and secure environment for the lifecycle management of provisioning and managing the lifecycle to apply the credit and debit application and credentials to a customer's UICC-based NFC application residing in the mobile device.

The business model that is applicable in any particular market will vary from country to country, dependent on the commercial environment, regulatory regime and local technical infrastructure. Nevertheless, research suggests that opportunities for some form of Pay-Buy-Mobile exist in most countries around the world.

The GSMA and the mobile operators are now proposing to jointly engage with the financial community to develop and implement a successful Pay-Buy-Mobile ecosystem.

### 4.2 Business drivers

The main business drivers for Pay-Buy-Mobile are:

- **Speed and convenience leading to higher transaction volumes:** Pay-Buy-Mobile offers a quick and convenient method of paying for goods and service, and gives customers an opportunity to replace cash. Research has suggested that the convenience of this new payment form factor will actually stimulate additional revenues, particularly low-value transactions.
- **Differentiation:** Pay-Buy-Mobile will offer banks the opportunity to differentiate their product through early adoption of the technology and the ability to offer new value-added services. Pay-Buy-Mobile will provide a new, bank-branded payment form factor combining mobile-specific characteristics (online device, keypad, display) with a whole new range of banking services (eg overview of last transactions, alerts, remote blocking on request), able to co-exist with traditional payment form factors, such as credit and debit cards, online banking and cash.
- **Access to customers:** Pay-Buy-Mobile will offer participating CIBs access to the MNO's customers, as well as improving revenue growth and retention rates.
- **Cost of management:** The life-cycle management cost of operating Pay-Buy-Mobile will, potentially, be less than the operating cost of payment cards in the long term.
- **Leverage contactless infrastructure investment:** Pay-Buy-Mobile will give the banks a further

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opportunity to utilise the installed contactless infrastructure in the form of this additional traffic.

- **Risk management:** Credit and debit cards on a UICC can be disabled almost immediately over the network. This will limit fraudulent usage of payment applications within stolen mobile telephones.
- **Reduced service delivery time:** the delivery time of the capability to the customer's phone can be reduced to a few minutes (via OTA) compared to traditional delivery methods. Furthermore, when the capability needs to be re-provisioned (e.g. when a mobile telephone has been reported stolen), this can also be achieved in minutes, thereby providing significant customer value.
- **UICC-based applications:** the UICC/SIM is a standard, ubiquitous element of most mobile phones. MNOs (and/or TSMs) will benefit from the opportunity to lease space on the UICC to the banks and other service providers, in return for operation of the underlying infrastructure: OTA transfer of applications and personalisation data; security management; and mobile customer service.
- **NFC technology:** mobile NFC furthers access to customers by allowing new types of services to be offered, leveraging the phone's User Interface i.e. screen and keypad: a real highway to innovation.

Additional value can be created by an initiative such as the Pay-Buy-Mobile scheme, and so the Banks and MNOs have a mutual interest to maximise the value created, thereby building a long-term, win-win relationship.

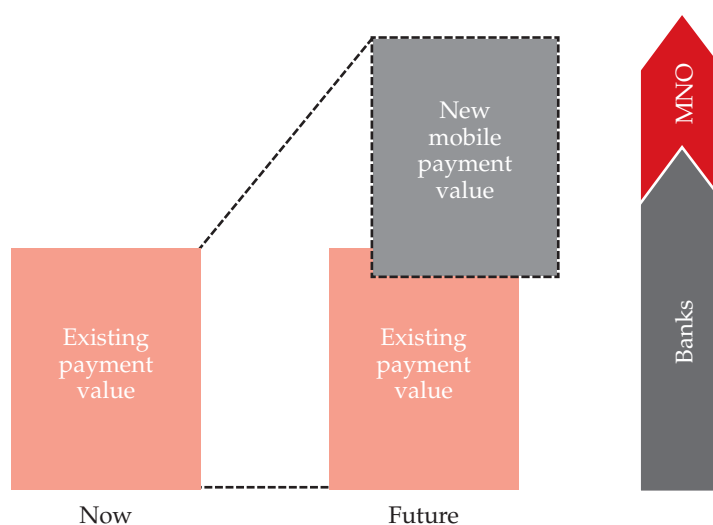


Figure 4 : Creation of New Pay-Buy-Mobile value

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## 4.3 Key success factors

In order for Pay-Buy-Mobile to be successful the following factors need to be addressed:

- **Value for all ecosystem members:** Pay-Buy-Mobile will be successful provided that the ecosystem is steady, provides value for all members, and is efficient. The ecosystem's efficiency will be enhanced by the introduction of a new role, the Trusted Service Manager, which is described in section 5.7.
- **Large customer base:** Pay-Buy-Mobile will only take off if Banks are able to reach a large customer base.
- **Customer trust:** will be built on the existing relationships between a client and his bank (payment) and a client and his MNO (mobile services).
- **Avoid fragmentation:** differing and incompatible technical solutions would lead to fragmentation, and so there is a need to ensure as much commonality between implementations whilst, after the universal credit card service, allow the banking industry to continue to make individual commercial decisions. Therefore:
  - **Inter-operability:** appropriate standardisation is essential in order to provide convenient and cost-effective mobile NFC services, thereby achieving economy of scale and global inter-operability. The Pay-Buy-Mobile applications and hardware need, therefore, to be standardised to ensure that, wherever possible, they are able to function anywhere around the world.
  - **Backwards compatibility:** the technical solution proposed by the MNO community is predicated on using the existing contactless infrastructure in the merchants' premises, which should minimise changes to the systems.
- **Partnership:** Cooperation between all ecosystem entities (e.g. Banks, MNOs, Trusted Services Managers and manufacturers etc) will be essential for the success of Pay-Buy-Mobile. Pay-Buy-Mobile will generate new business opportunities and value, and does not challenge existing card transactions business.
- **Certification:** the Pay-Buy-Mobile technical solution has been carefully designed to satisfy all of the known requirements of the financial services industry. Banks, and MNOs, payment scheme companies and vendors need to work together to build trust in the solution and achieve certification of the solution, where required, to allow use as a live service, and ensure that the UICC solution can be demonstrated to have security comparable to existing payment card products.

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## 4.4 Roadmap

The roadmap for the introduction and implementation of Pay-Buy-Mobile will depend on the following factors:

- Introduction of contactless payment services by the payment solutions companies.
- Adoption and infrastructure roll out of contactless payment by the merchant community.
- Acceptance of contactless payment by the mobile subscribers.
- The completion of the required standards needed to support NFC M-Payment services (2007-2008).
- The availability of UICC-based NFC-enabled mobile phones. Manufacturers plan to provide production version phones in 2008/2009.

Several of the mobile phone manufacturers are currently providing prototype NFC-enabled mobile phones for trials by mobile operators with plans to provide commercial versions of the phones in 2008.

With the completion of the required standards anticipated in 2007 and the availability of UICC-based NFC-enabled handsets in 2008, it is expected that Pay-Buy-Mobile services will start to be realised in several regions around the globe in the 2008 timeframe.

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## 5. Ecosystem and Value chain

This section describes the roles and responsibilities of the key players within the Pay-Buy-Mobile ecosystem and value chain. The Pay-Buy-Mobile ecosystem builds on the traditional payment infrastructure with an expanded value chain incorporating the following players:

- Customer
- Merchant
- Acquirer
- Card Issuing Bank (CIB)
- Payment solution company
- Mobile Network Operator
- Trusted Service Manager
- Mobile Handset Manufacturer
- UICC Manufacturer
- Terminal/Reader Manufacturer
- NFC chip manufacturer
- IC chip manufacturer

Figure 5 shows the traditional credit card payment ecosystem, and Figure 6 the UICC-based new Pay-Buy-Mobile ecosystem.

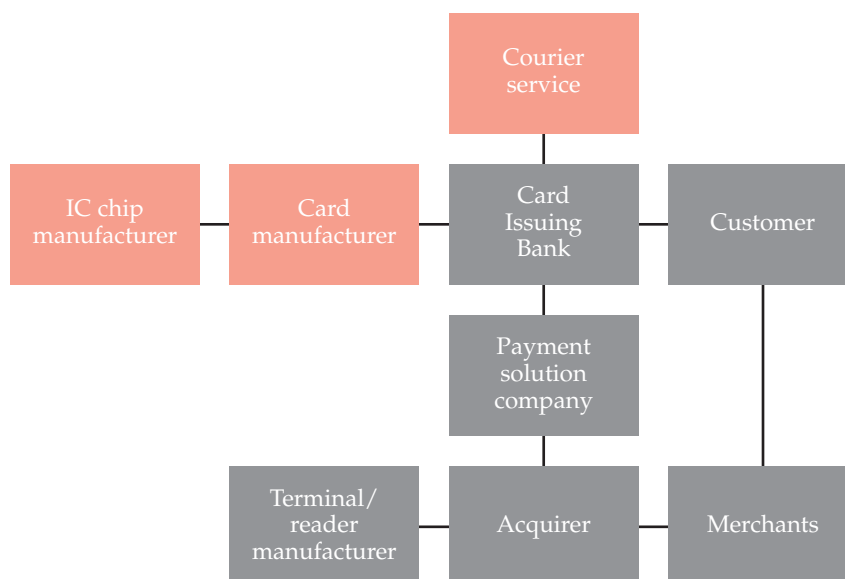
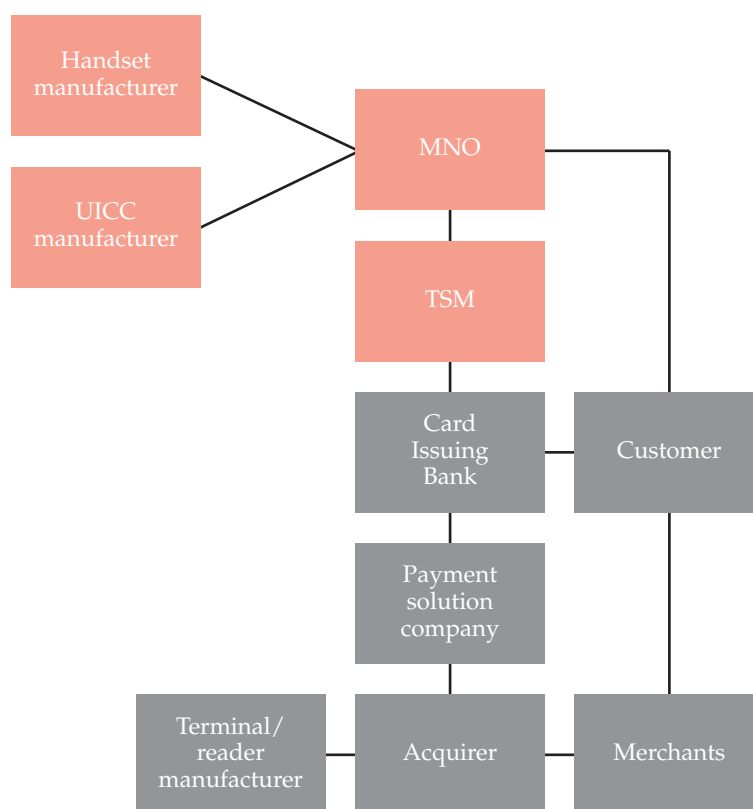


Figure 5 : Existing credit card ecosystem

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**Figure 6 : Pay-Buy-Mobile ecosystem**

No significant change is anticipated to the payment transaction infrastructure and process. The role of the various players in the new ecosystem is briefly described below.

## 5.1 Customer

The Pay-Buy-Mobile customer is required to be a subscriber of a mobile network operator. The customer is required to have an NFC-enabled mobile phone with a compliant UICC smart card provided by the mobile network operator. The customer enters into a service agreement with a CIB for the NFC M-Payment service.

## 5.2 Merchant

The merchant is the provider of the goods and services being purchased by the customer at the point of sale (POS) terminal. The merchant has a contract with a merchant acquirer that allows the merchant to accept credit and debit payments which are then processed over the appropriate payment processing network. The merchant needs to be equipped with a contactless POS terminal based on the ISO 14443 standard in order to enable Pay-Buy-Mobile.

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## 5.3 Acquirer

The acquirer maintains the merchant account that permits the merchant to accept credit and debit transactions. The acquirer also provides the interface to the processing network for the authorisation and clearing of the merchant's transactions. The functions provided by the acquirer remains the same in the new Pay-Buy-Mobile ecosystem.

## 5.4 Card Issuing Bank

The Card Issuing Bank (CIB) provides the overall payment service and is responsible for the associated customer care. The CIB is responsible for the issuing of the payment application and the customer's personalisation data. The CIB is also responsible for establishing the formal agreement with the customer for the payment service, which occurs prior to the provisioning of the application on the UICC.

## 5.5 Payment solutions company

The payment solutions companies (such as Visa, MasterCard, American Express, China UnionPay, JCB, etc) maintain their payment networks, and provide other services to its banks such as approval and certification, as well as defining its own brand requirements for different payment form factors. They also define payment specifications and provide transaction processing services to support them. To support Pay-Buy-Mobile, no significant change is anticipated to these payment networks or other national payment networks.

## 5.6 Mobile Network Operator

The mobile network operator (MNO) is a key addition to the ecosystem and is required to enable Pay-Buy-Mobile. The role of the MNO is to:

- Provide and maintain the network infrastructure that enables the secure OTA delivery and maintenance of the payment application to the UICC smart card.
- Provide the Security Domain for the payment application on the UICC, which is then controlled by the TSM or CIB
- Provide the customer, when required, with NFC-enabled handsets and the required UICC smart card.
- Provide mobile services customer care.

The MNO brings the assets of a mobile customer base, smart card and network infrastructure to the relationship.

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## 5.7 Trusted Service Manager

The Trusted Service Manager (TSM) is one of the new additions to the payment industry. This entity is primarily responsible for securely distributing, provisioning and life-cycle management of the Pay-Buy-Mobile application and other NFC services to the mobile network operators' subscriber base on behalf of the service providers. The TSM will have business relationships with both the mobile network operators and the service providers.

## 5.8 Terminal/Reader Manufacturer

The role of the terminal/reader manufacturer is to provide NFC-enabled POS terminals/readers to the merchants and acquirers. These will be the same POS terminals used for contactless payment transactions with contactless payment cards.

## 5.9 UICC Manufacturer

Every GSM/3G mobile network operator has a business relationship with one or more UICC manufacturers. The UICC manufacturer is contracted to provide the mobile operator with the required UICC cards. The Pay-Buy-Mobile application is typically designed to operate on a specific type of UICC smart card sold by the card manufacturer. The UICC will be provisioned with one or more security domains, which will be managed by the TSM, CIBs and other service providers. The UICC manufacturer will have a direct relationship with the mobile network operator, which will define the requirements for the UICCs.

## 5.10 IC chip manufacturer

The manufacturers of chips used in EMV credit and debit cards are typically the same as those supplying the UICC manufacturers for the mobile industry, providing valuable cross-sector expertise.

## 5.11 Mobile Handset Manufacturer

The role of the mobile handset manufacturer is to provide standardised NFC-enabled handsets that incorporate the UICC as the secure element for NFC services. The mobile handset manufacturer will have a direct relationship with the mobile network operator, which will define the requirements for the handsets.

It should be noted that, in the mobile payment value chain, none of the new players actually participate in the transaction processing, which remains the collective responsibility of the CIBs, the merchant acquirer and the payment network.

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## 5.12 NFC chip manufacturer

The role of this value chain member is to supply the standards-conforming NFC chip to the handset manufacturer for integration with the handset.

Figure 7 shows the value stream data flows between the key entities in the Pay-Buy-Mobile ecosystem.

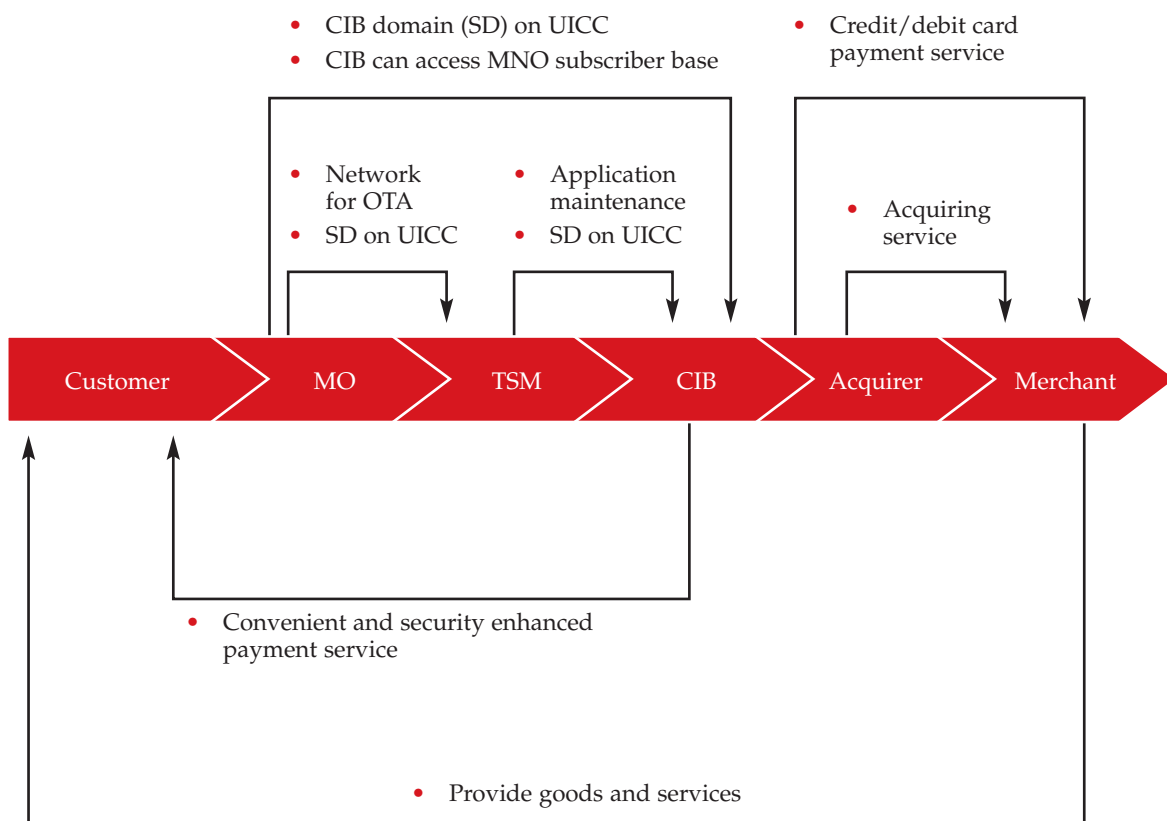


Figure 7 : Pay-Buy-Mobile value chain

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## 6. Pay-Buy-Mobile Business Models

The TSM is introduced to the Pay-Buy-Mobile ecosystem as a link between the CIB and the MNO. As shown in Figure 8, it not only links a single CIB and a single MNO, but should be an integrated point of linkage between multiple CIBs and multiple MNOs. Depending on the placement of this role, various types of Pay-Buy-Mobile business models are possible, to enable an efficient ecosystem.

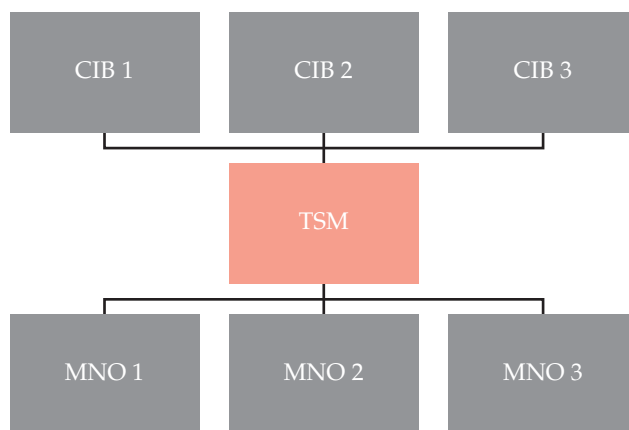


Figure 8 : Positioning of the TSM

### 6.1 Pay-Buy-Mobile Business Model Analysis

There are four principal business models:

1. The MNO-centric model – in which the MNO performs the TSM role
2. The Independent entity model – in which a trusted third party performs the TSM role
3. The CIB-centric model – in which the CIB performs the TSM role
4. The Combination model – a combination of two or three of the above models, depending on domestic market environment

It is possible to have multiple TSMs within a Pay-Buy-Mobile ecosystem, as well as having a combination of MNOs or CIBs performing the role of TSMs in the market.

This emphasises the flexibility of the Pay-Buy-Mobile business model, in which a participant can choose the most suitable model that meets the market requirements. However, it may also result in a complicated service provisioning scheme if the concrete relationships and roles of each participating entity is not clearly defined.

The dotted lines in Figure to **Error! Reference source not found.** indicate which party performs the TSM role.

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## 6.1.1 MNO-centric model

In this model, the MNO builds and integrates the TSM capabilities within its network infrastructure, offering a secure and open third-party interface to CIBs.

The MNO can provide the flexibility in customising service provisioning for NFC M-Payment services. For example:

The MNO can rapidly develop a user interface suitable for a mobile environment taking into consideration the financial service community's requirements;

Seamless integration of the TSM functions with the MNO's existing Business Support System (BSS).

In this model, MNOs would make an investment in the TSM infrastructure while CIBs provide the existing payment infrastructure to enable Pay-Buy-Mobile. When compared with the other three models, the CIBs would need to make a relatively small investment in building the Pay-Buy-Mobile infrastructure while getting an opportunity to access the MNO customer base. They will, however, have to integrate to each MNO in the market separately.

Figure 9 illustrates MNO-centric model.

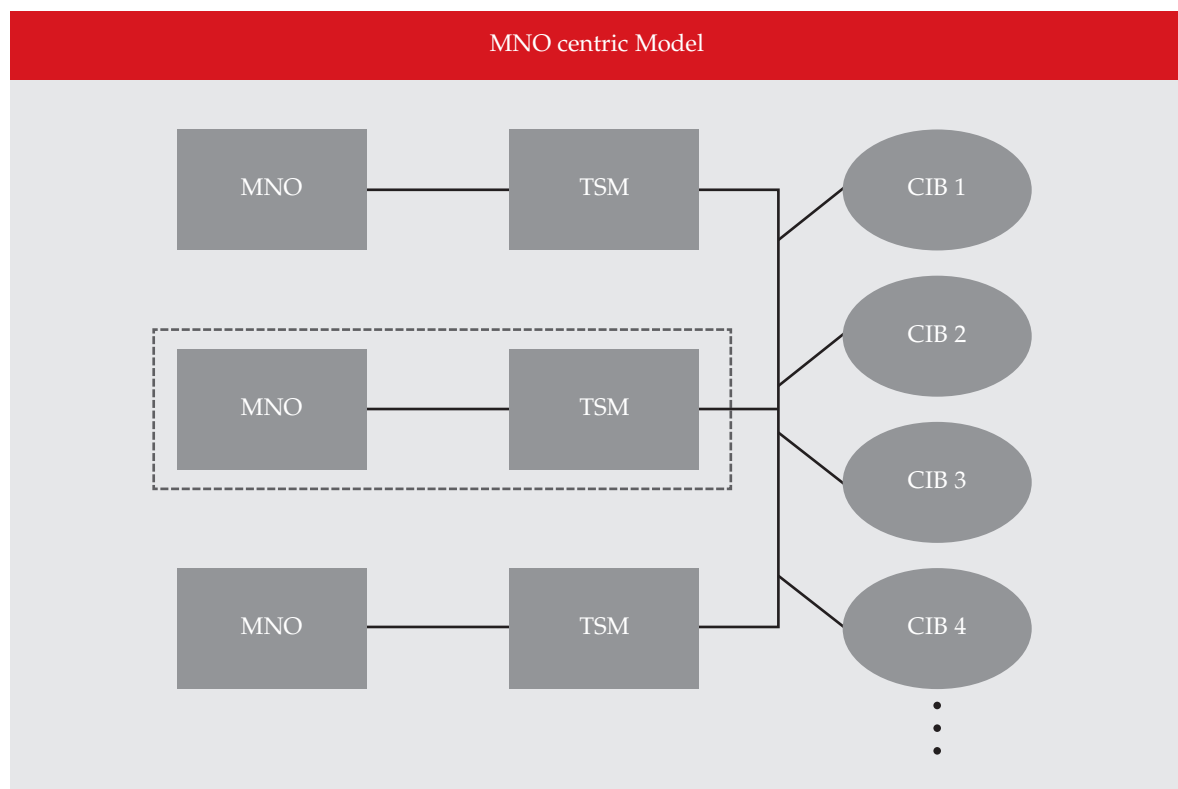


Figure 9 : MNO-Centric Model

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## 6.1.2 The Independent Entity Model

In this model an independent entity (Trusted Third Party - TTP) performs the role of the TSM and acts as the single point of contact between the MNOs and the CIBs (see **Error! Reference source not found.**). The TTP will perform the overall management of the different Security keys of each security domain on the UICC. This model reduces the overall complexity for the TSM in the Pay-Buy-Mobile ecosystem by providing an integrated interface for MNOs and CIBs.

This model removes the need for either the MNOs or the CIBs to make an investment in the TSM infrastructure. Adoption of the model is dependent upon maintaining the integrity and neutrality of the independent third entity, being trusted by both the MNOs and the financial institutions.

Figure 10 illustrates the independent entity model.

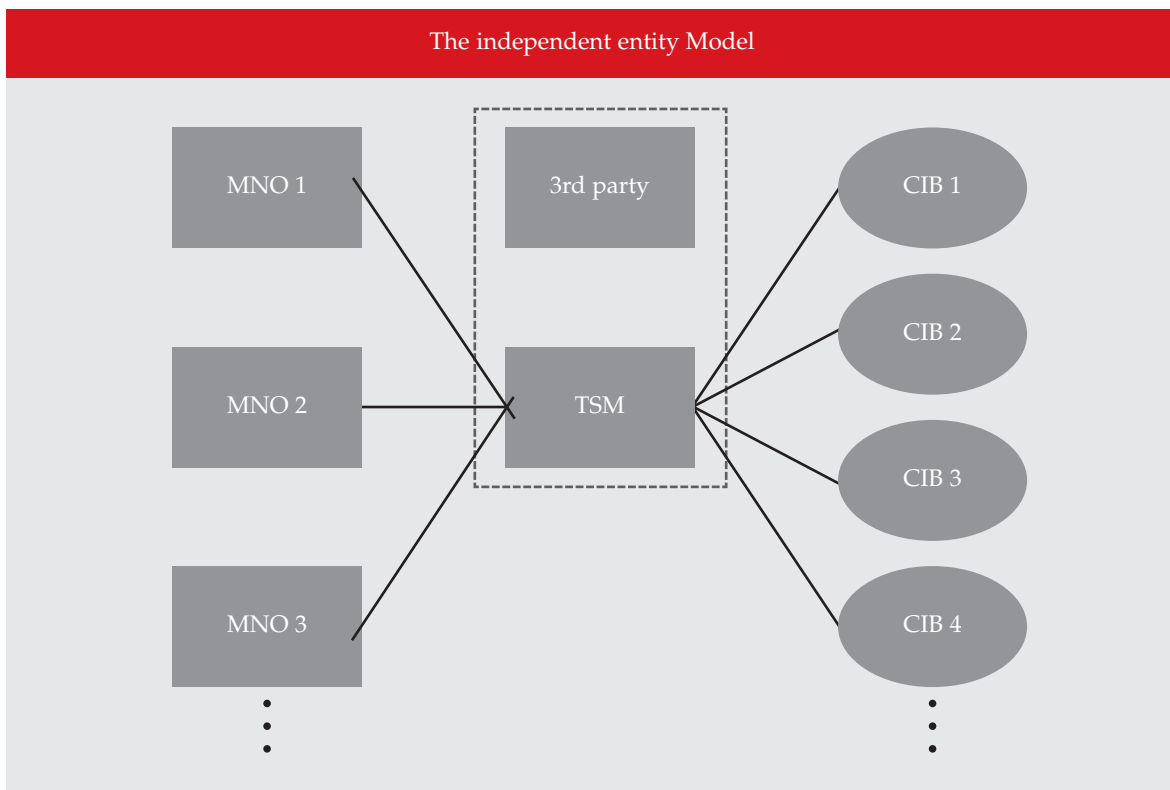


Figure 10 : The Independent Entity Model

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## 6.1.3 The CIB-Centric Model

In the CIB-centric model, the CIB acts as the TSM and integrates the participating MNOs in the market. The CIB would need to bear all the associated investment in building TSM infrastructure. For small-sized CIBs, this investment can be an entry barrier.

The MNOs will still provide UICC space to the CIBs in this model.

Figure 11 illustrates the CIB-centric model.

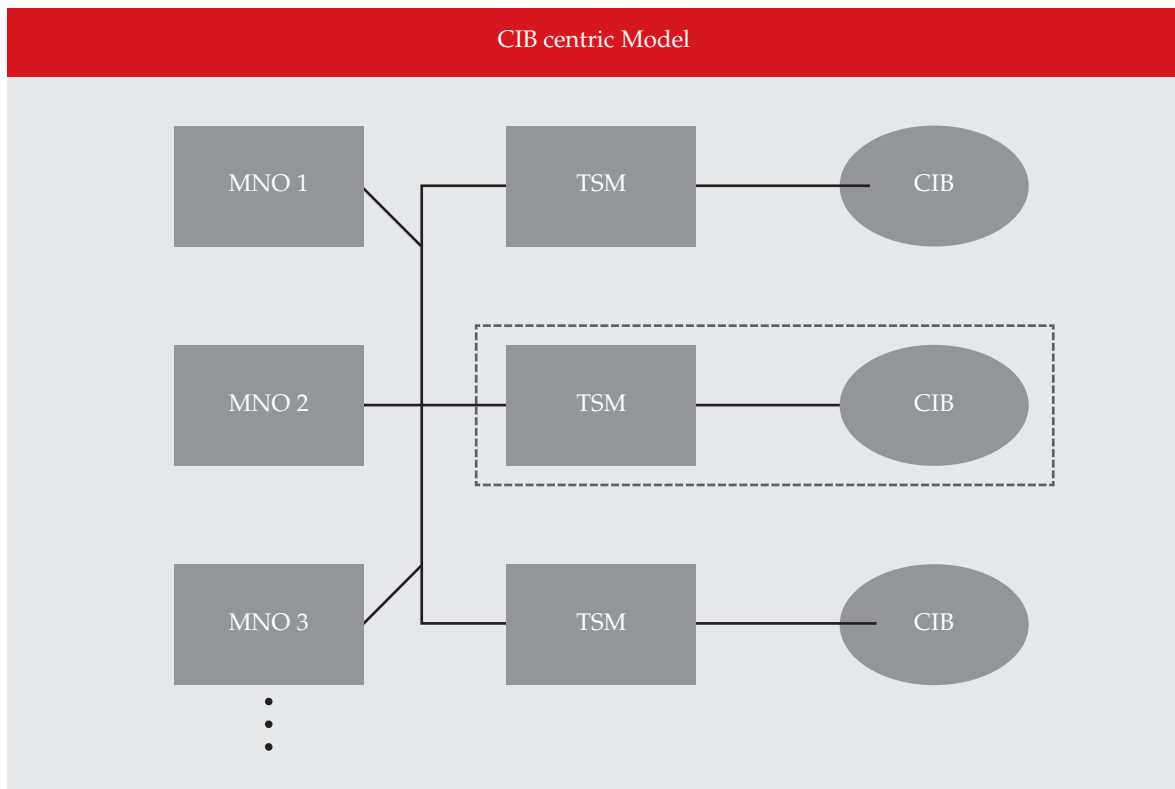


Figure 11 : CIB Centric Model

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## 6.1.4 The Combination Model

In this model, the role of the TSM can be played by any combination of MNO, CIB, and independent entity. For example, the participating MNOs and the CIBs may jointly form a TSM to serve their customers. Investments are shared between the initial founders of the TSM. After forming the TSM, new partners can join the consortium.

Figure 12 illustrates the combination model.

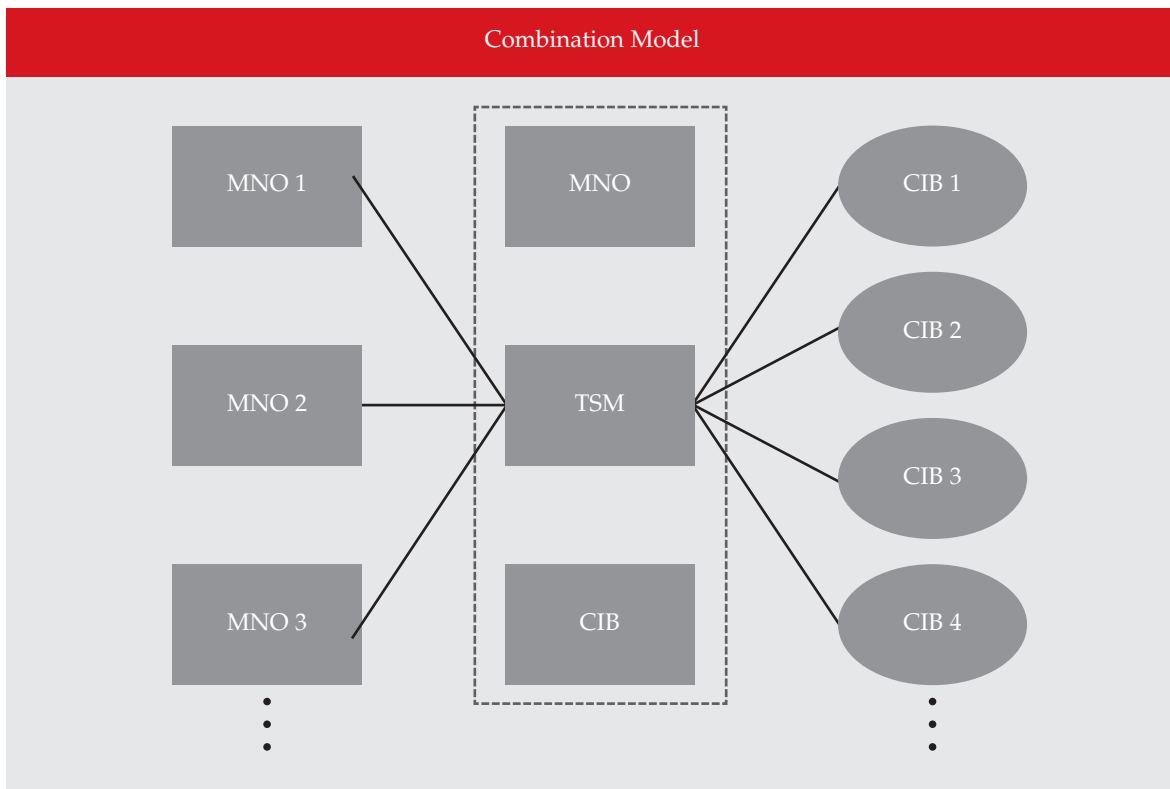


Figure 12 : Combination Model

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## 7. Conclusions and next steps

### **The business case**

A compelling business case exists for the introduction of NFC M-Payment schemes around the world. Customer demand for the services is high, and the scheme offers all stakeholders a win-win opportunity, with many additional revenue and marketing opportunities. The Pay-Buy-Mobile initiative will trigger the first of many UICC-based NFC-enabled mobile services.

Mobile NFC technology is a key enabler of the solution: the OTA functionality offers valuable safeguards and important functionality; whilst the mobile platform is a ubiquitous device with local power, a screen, keyboard and local computational power.

The UICC is a critical component of the solution: it provides a secure method for Pay-Buy-Mobile, giving service providers the confidence to exploit it as a channel for carrying out NFC M-Payment transactions securely and flexibly, independent of one another.

With the completion of the required standards anticipated in 2007 and the availability of NFC-enabled handsets in 2008, it is expected that NFC M-Payment services will start to be realised in several regions around the globe in the 2008 timeframe.

### **Building trust**

Banks are a key component of the Pay-Buy-Mobile ecosystem, having an unsurpassed track record of building and operating financial transaction systems and networks. The GSMA invites the financial services community to work alongside the MNOs to agree mutually acceptable commercial models and implement an efficient ecosystem.

A level of trust is required between the MNOs and the banks in order to successfully move forward with Pay-Buy-Mobile. One of the ways to establish the needed level of trust is to understand and incorporate the requirements of the banks and MNOs. The role of the TSM will be to implement the requirements of both parties, and is essential for the establishment of a stable and efficient Pay-Buy-Mobile ecosystem, providing value for all stakeholders

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## Factors for success

Establishment of a large customer base is critical to the success of Pay-Buy-Mobile, and so all stakeholders should work closely together to establish Pay-Buy-Mobile as a set of global, interoperable and transparent services.

There is a need to avoid further fragmentation of the market that would inevitably follow if differing and incompatible technical solutions were to be implemented, and so there is a need to ensure as much commonality between the systems as possible, whilst still allowing stakeholders latitude to make individual commercial decisions. Therefore:

- The payment infrastructure needs to be globally interoperable, and this can be achieved by utilising the existing payment networks and contactless readers.
- The Pay-Buy-Mobile applications and hardware need to be standardised to ensure that, wherever possible, they are able to function anywhere around the world.

## Next steps

The next steps for the Pay-Buy-Mobile initiative, therefore, are:

- Publicity for the Pay-Buy-Mobile initiative is expanded in order to begin to raise the profile of the capability with the general public and make prospective stakeholders aware of its value, and:
- The MNO community engages with the financial services community to build mutually acceptable models and implement an efficient ecosystem.
- Eleven operators select the business model appropriate for their market and execute trials, and through these trials will demonstrate the validity of the technical solutions and commercial frameworks, whilst determining customer behaviour jointly with the payment solutions companies and card issuing banks.
- An analysis is carried out on the outcomes of the trials to identify potential requirements/enhancements that need to be addressed as well as aspects that require further standardisation.

The GSMA to lead standardisation activities to consolidate a common set of requirements and specifications.

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## 8. Acronyms and definitions

Acronym	Meaning
BSS	Business Support Systems
CIB	Card Issuing Bank
EMV	Europay, MasterCard and Visa
ETSI	European Telecommunications Standards Institute
ETSI-SCP	European Telecommunications Standards Institute-Smart Card Platform
GSM	Global System for Mobiles
GSMA	GSM Association
IC	Integrated Circuit
ISD	Issuer Security Domain
ISO	International Standards Organisation
MNO	Mobile Network Operator
NFC	Near Field Communication
OTA	Over The Air
PIN	Personal Identification Number
POS	Point Of Sale
SD	Security Domain
SE	Secure Element
SIM	Subscriber Identity Module
TSM	Trusted Services Manager
UICC	Universal Integrated Circuit Card
USIM	Universal Subscriber Identity Module

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**Authorisation Process** The authorisation process is used to decide if a person, program or device X is allowed to have access to data, functionality or service Y. Most modern, multi-user operating systems include an authorisation process. This makes use of the authentication process to identify consumers.

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**Authentication** Authentication is the overall process of establishing that the actor being authenticated is indeed the actor in whose name assertions are being made, with an implicit or explicit level of confidence and liability. The actor in question may be a human or any non-human system entity (client, server, application, etc). The authentication authority may perform authentication for the benefits of another that resides in another domain.

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**CHIP & PIN** Chip and PIN is the name of the initiative in the United Kingdom to implement the EMV standard for secure payments.

History:

Until the introduction of Chip and PIN, all face-to-face credit or debit card transactions used a magnetic stripe or mechanical imprint to read and record account data, and a signature for verification. Under this system, the customer hands their card to the clerk at the point of sale, who either “swipes” the card through a magnetic reader or makes an imprint from the raised text of the card. In the former case, the account details are verified and a slip for the customer to sign is printed. In the case of a mechanical imprint, the transaction details are filled in and the customer signs the imprinted slip. In either case, the clerk verifies that the signature matches that on the back of the card to authenticate the transaction.

This system had proved reasonably effective for a number of years, but had a number of security flaws, including the ability to steal a card in the post, or to learn to forge the signature on the card. More recently, technology has become available on the black market for both reading and writing the magnetic stripes, allowing cards to be easily cloned and used without the owner’s knowledge.

How it works:

To solve this, banks and retailers are replacing traditional magnetic stripe equipment with that based around smart cards, which contain an embedded microchip and are authenticated automatically using a PIN. When a customer wishes to pay for goods using this system, the card is placed into a “PIN pad” terminal (often by the customer themselves) or a modified swipe-card reader, which accesses the chip on the card. Once the card has been verified as authentic, the customer enters a 4-digit PIN, which is checked against the value stored on the card; if the two match, the transaction will be automatically completed.

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**Credit Card Payment**

**A credit card is a payment instrument that enables a loan to the customer** who has signed a contractual agreement with the Financial Institution to repay as agreed.

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**Credentials**

Actor-specific information that is transferred stored and processed in order to authenticate an actor or authorise a transaction.

Authentication credentials may be of three different types:  
– “Something you know” (e.g. a password)  
– “Something you have” (e.g. a bank card,)  
– “Something you are” (e.g. an iris reading, a MAC address)

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**EMV**

EMV is a standard for interoperation of IC cards (“Chip cards”) and IC capable POS terminals, for authenticating credit and debit card payments. The name EMV comes from the initial letters of Europay, MasterCard and VISA, the three companies that originally cooperated to develop the standard. Europay International SA was absorbed into MasterCard in 2002. JCB (formerly Japan Credit Bureau) joined the organisation in December 2004. IC card systems based on EMV are being phased in across the world, under names such as “IC Credit” and “Chip and PIN”.

The EMV standard defines the interaction at the physical, electrical, data and application levels between IC cards and IC card processing devices for financial transactions. Portions of the standard are heavily based on the IC Chip card interface defined in ISO 7816.

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**Identity Management (IDM)**

A set of processes, technologies and services in order to manage principals’ identities (creation, maintenance and termination of principal accounts), secure access to the operator’s resources (data and services) and protect principals’ private data.

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**OTA**

Over-the-air programming (OTA), also known as over-the-air service provisioning (OTASP), over-the-air provisioning (OTAP) or over-the-air parameter administration (OTAPA), is a method of distributing new software updates to handsets or provisioning handsets with the necessary settings with which to access services such as WAP or MMS. Some phones with this capability are labelled as being “OTA capable.”

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<b>Payment &amp; Payment Solutions Company</b>	<p>A payment is the transfer of wealth from one party to another. A payment is usually made in exchange for the provision of goods, services, or both, or to fulfil a legal obligation. Usually, current payment methods can be cash, cheque, debit card, credit card or bank transfer. For the purposes of this document, means of payment is restricted to credit card and debit card. Therefore within this document, the term “payment” refers to credit and debit types of payment only. Payment card company means credit card company and/or debit card company.</p>
<b>POS</b>	<p>POS (or PoS) is an abbreviation for point of sale (or point-of-sale, or point of service). This can mean a retail shop, a checkout counter in a shop, or a variable location where a transaction occurs in this type of environment. Additionally, point of sale sometimes refers to the electronic cash register system being used in an establishment. Point of sale systems are used in restaurants, hotels, stadiums, casinos, as well as retail environments – in short, if something can be sold, it can be sold where a point of sale system is in use.</p>
<b>Registration</b>	<p>The process normally comprised of:</p> <ul style="list-style-type: none"><li>• enrolment</li><li>• binding between a verifiable user ID and a system-assigned ID (policy dependent)</li><li>• provisioning (client and systems)</li></ul>
<b>Security Domain</b>	<p>On card entity providing support for the control, security and communication requirement of an off-card entity, supporting services such as key handling, encryption, decryption, digital signature generation and verification for their provider’s application.</p>
<b>Settlement</b>	<p>Settlement (of securities) is the process whereby securities or interests in securities are delivered, usually against payment, to fulfil contractual obligations, such as those arising under securities trades.</p> <p>This involves the delivery of securities to perform contractual delivery obligations. It usually also involves the corresponding payment of a purchase price. Usually trading precedes settlement, which involves entering into contracts of sale and purchase.</p>
<b>SIM</b>	<p>Subscriber Identity Module: an application on the UICC that stores and handles the Subscriber identities (IMSI) and also the authentication and session key derive functions for GSM (A3/A8)</p>

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**Smart card**

A smart card, chip card, or integrated circuit card (ICC), is defined as any pocket-sized card with embedded integrated circuits, which can process information. This implies that it can receive input, which is processed – by way of the ICC applications - and delivered as an output. There are two broad categories of ICCs. Memory cards contain only non-volatile memory storage components, and perhaps some specific security logic.

Microprocessor cards contain volatile memory and microprocessor components. The card is made of plastic, generally PVC, but sometimes ABS. The card may embed a hologram to avoid counterfeiting.

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**Subscriber or (also known as Customer or Bill Payer)**

Role carried out by a company (usually represented by an administrator) or a person (or a group), which pays for the services offered by the operator. These services are used by the End Users linked to the Subscriber (i.e. Subscriber: End User relationship is 1:N, N=1,2,...). A person (or a group) may play both roles, Subscriber and End User, but also only one of them.

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**TSM**

TSM (Trusted Service Manager) securely distributes and manages the Service Providers services to the MNO customer base.

The TSM role is to:

- Provide the single point of contact for the service providers to access their customer base through the MNOs
  - Manage the secure download and life-cycle management of the NFC M-Payment application on behalf of the service provider
- 

**UICC**

The UICC (Universal Integrated Circuit Card) is a smart card that contains account information and memory that is used to enable GSM cellular phones. One of the applications running on the smart card is the SIM, or Subscriber Identity Module. In common parlance the term “UICC” is not used but the phrase “SIM” is used to describe the smart card itself.

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**USIM**

An application on the UICC that stores and handles the Subscriber identities (IMSI) and also the authentication and session key derive functions for UMTS (3G).

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## 9. Referenced documents

Document	Title
Mobile NFC services white paper, GSMA, Feb 2007	<b>Mobile NFC services</b>
Mobile NFC technical guidelines, GSMA, April 2007 v1	<b>Mobile NFC technical guidelines</b>
Mobile NFC technical guidelines, GSMA, November 2007 v2	<b>Mobile NFC technical guidelines</b>

1 Initial results of a survey conducted in line with a trial of MasterCard® Mobile with PayPass, June 2007

2 'Mobile Contactless Payments -Growth on the Horizon', Strategy Analytics, October 2006

3 As defined in the Global Platform specification v2.2

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