

Electronic Payment Systems, Electronic Money and the Internet: The United Kingdom Experience to Date

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The level of Internet access in the UK is expanding rapidly. Although the volume of business being transacted using the Internet is currently insignificant in relation to the overall UK economy, there is a general expectation that it will grow exponentially over the next ten years. The future vision is of increasing volumes of business transacted on the Internet using electronic methods of payment and eventually electronic money in the form of electronic-cash. This article reviews some of these developments in the overall context of the UK payment system.¹ It considers the current structure and examines some of the broader issues of technological innovation that will need to be considered before this future vision becomes more of a reality.

1. Introduction

Electronic payment systems and in particular, methods of payment being developed to support Internet based commerce cannot be examined in isolation. A failure to place these developments into proper context is likely to result in undue focus on the various experimental initiatives to develop electronic forms of payment without a proper reflection on the broader implications for the existing payment systems. The reality of the current UK payment system is that it is primarily paper based with more than 80 % of all individual payment transactions taking the form of cash payments, cheques or other paper credits. The majority of individual payment transactions involve goods and services being exchanged for cash that are made face to face, i.e. both buyer and seller are physically present. Furthermore, a high percentage of individual non-cash payments continue to involve the exchange of paper in some form. Electronic payments in their purest form, where the instructions to pay are generated and received elec-

tronically, remain the exclusive domain of an electronic network that has been specifically designed for handling high value payments.

This paper is divided into six separate parts including the Introduction. In the second section, I will examine some of the key elements associated with a modern payment system. Each payment system must satisfy certain minimum requirements in order to be able to operate successfully. The key issues include a stable legal framework, agreed procedures for settlement and clearing of payments as well as measures that ensure payment messages are secure and that fraud is minimized.

The paper then goes on to provide an overview of the UK payment system and how it is divided into distinct and separate elements. The section highlights the sharp contrast between a same day electronic payment system that exists largely to service the financial sector and the other types of payment system. It identifies the dominant role of cash as a payment medium and the other different types of payment system which service business and consumer requirements.

The fourth section looks at the ways in which the payment sector is actually used by different segments, specifically the financial, business, personal and public sectors. This leads directly to a discussion of the existing alternative methods for making payments over the Internet and some of the implications involved in choosing between different alternatives. The section includes a discussion of some of the institutional barriers that are likely to exist when trying to adopt new payment methods that do not immediately resonate with existing business practice.

The fifth section considers various current initiatives in developing Internet based payment systems. The section discusses the viability of current electronic cash initiatives as well as the development of smart card technology for small payments. Existing industry initiatives to develop common smart card formats are also addressed. The final section of the paper develops some conclusion from the discussion.

2. Key Elements of the Payment System

Payment systems are central to the efficient operation of the economy since they determine

how quickly and how securely a seller of goods and services will receive payment. The associated transaction costs will play a key role in which payment system is selected from the range of alternatives on offer.

There are two basic types of exchange mechanism. Payments can be made in cash (i.e. notes and/or coin) or they can involve the transfer of funds held with a bank. A third possibility also applies (but is not taken into account here), namely barter, where only goods are exchanged without any financial payment.

Non cash payments require three separate elements. The buyer must have an agreed means of *payment authorisation* and instructing its bank to effect a transfer of funds. The seller's bank and the buyer's bank need an agreed method of exchanging payment instructions. This is referred to as *payment clearing*. Finally the buyer's bank and the seller's bank must have an authorised method of *payment settlement*. Payment settlement can be done in a number of ways. It can involve adjusting accounts which the two banks have with each other, or it can be achieved through accounts each bank holds with a third-party, often a Central Bank. It is important to distinguish between these three key elements when considering electronic payments using the Internet. Payment authorisation and payment clearing essentially involve exchanging messages. The Internet is ideally suited to perform this role, providing there can be sufficient security safeguards incorporated. However, payment settlement is a separate process which must be linked to existing payment mechanisms and which will have much broader implications for financial stability and wider monetary policy.

A payment system can only function successfully when it operates within a secure legal environment. It can only function properly if there are clearly defined rights and obligations governing the actions of the various parties which are involved. A buyer giving payment authorisation details must be secure in the knowledge that this information will not be misused, that it will be acted upon promptly and that there will be adequate compensation if operational mistakes are made. Similarly, a seller has to be secure that there will be sufficient penalties attached to any fraudulent issuance of payment authorisation (e.g. writing a

cheque which will not be accepted by the buyer's bank). Ideally, a seller prefers to be protected against the risk that goods or services released to the buyer will not ultimately be paid for. This is why credit cards offer a very effective payment mechanism for Internet commerce.

The structure of a particular legal system and the broader system of governance of which it forms a part, will have important implications for how a payment system will operate on a day to day basis. A payment system that has a strong statutory basis will depend on rules and regulations previously defined in detail having the force of national law. The Central Bank will often have the power to change or amend regulations with full statutory backing. Such a system is likely to offer the necessary transparency in its normal operation but may encounter problems of definition and liability when there are unforeseen problems or if new developments take place. Alternatively, the legal framework can be contractually based. Instead of depending on statute, the rules and regulations governing the operation of the payment system is based on a series of contracts. These may be explicit and in written form, or the contracts may be implicit, based on legal precedent. In the UK, the legal framework for payment systems is principally contract based although in key areas, legal statutes have been enacted. As new methods of electronic payment using the Internet are developed, the legal framework needs to be amended and adapted to fit the new circumstances. Both a statute based or contract based legal framework have certain advantages and disadvantages in this respect. A contract based systems can be more adaptable in its detailed application. However, a statute based system will be more effective at introducing step changes in the payment system, for example when introducing the new Euro currency.

In each of the major developed economies there is a need to settle very large payment amounts resulting from financial transactions. All of the major industrial countries have developed separate, same-day electronic payment systems for handling these large payments. They consist principally of foreign exchange transactions, debt service on large loans (i.e. payments of principal and interest) and the sale and purchase of bonds or company shares. The

need to make the corresponding payments results in a diametrically opposed relationship between payment volume and the number of payments. Electronic same day payments will typically account for over 90 % of payment monetary value but will represent only a small fraction of the total payment transactions carried out on any particular day. This is particularly true for the UK where the payment system has to accommodate the large value payments generated by financial institutions operating in the City of London, arguably the largest and most important international financial centre in the world.

3. The UK Payment System : A Short Overview

The UK payment system demonstrates the sharp contrast between the different payment media when one contrasts numbers of individual transactions with the volume of payments in monetary terms. Each year an estimated 37+ billion individual payment transactions take place in the UK with a total monetary value of around £39.3 trillion (i.e. 1.0^{12}). The amount is significant in relation to the size of the total UK economy. It represents around 61 times the total UK GDP (Gross Domestic Product) or to put it another way, in a period of six days, the cumulative value of total payments being made is equivalent to the total annual output of the UK economy. These figures are not peculiar to the UK. In the United States, it takes only 3 ¼ days to achieve a payment volume equivalent to GDP and in Japan it is only 2 ½ days.

These figures illustrate the fact that the UK payment system really consists of two distinct elements. On the one hand, there are the payment networks and systems that service the non-financial economy consisting of goods and services that are produced, sold or consumed within the UK. These include primarily cash payments, cheques, debit cards, credit cards as well as electronic direct debits and credits. The total individual number of payments included under these headings amounted to 37.4 billion in 1997, i.e. 99.97 % of the total figure. Within this group of payment systems, further distinctions can be made between paper based and electronic payment systems as well as between cash based and non cash based methods of

payment which are discussed in greater detail below.

When considered in terms of the number of individual transactions, the UK payments system remains dominated by small cash payments consisting of notes and coins. In total, cash represented 74 % of all payments amounting to an estimated 25.5 billion individual transactions. The dominance of cash as a payment medium also occurs in other major industrial economies. In some countries like Japan, a large number of transactions involving larger payments are also made using cash. In order to make cash payments, consumers and businesses have to acquire the cash from the banking system. Cash acquisition is an important payment transaction category in its own right. In 1997 there were approximately 2.2 billion such transactions amounting to total cash withdrawals of £156 billion. Cash acquisition has increasingly involved using ATMs rather than bank or building society branches. In 1997, £89 billion was withdrawn from 23,000+ ATMs in the UK, compared to £16 billion in 1986 when the number of ATM machines was restricted to only 10,500.

Non cash, non high value systems provide the basic payment infrastructure which the UK economy requires to operate the business and commercial sector as well as to service consumers. Payment methods include cheques, electronic transfers, credit cards and debit cards. Cheques and paper credits continue to represent the largest category with 3.5 billion transactions averaging less than £100 per cheque. Modern cheque clearing in the UK remains a costly and labour intensive exercise. The UK unlike other countries including Germany has only recently started to permit "truncation", that is the replacing the physical presentation of cheques with the transfer of data in its electronic form. This meant that in order to process cheque payments, an arcane system of moving each individual cheque from the recipient of the payment, to a central clearing location and then to the branch where it was issued was required.

The requirement to return cheques in their physical form to the branch where they have been drawn, was dictated by a piece of 19th century legislation, the Bills of Exchange Act, 1882 which has only recently been repealed. A new electronic method of truncation called

IBDE (Inter Bank Data Exchange) was initiated by APACS in February 1996. While it has replaced some physical movement of cheques, a move to a more comprehensive electronically based system has been delayed by the uncertainties which are associated with the replacement of Sterling by the Euro as the national currency.

Electronic transfers made using BACS (Bankers' Automated Clearing Services Limited) represent an increasingly important component and averaged 2.8 billion transactions in 1997. BACS was created by the major UK clearing banks as a competitive response to the creation of National Girobank in 1968 by the Labour Government led by Harold Wilson. The Wilson Government wanted to establish an institution which would provide cheap money transfer facilities for the large majority of the population which at that time did not have bank accounts. BACS initially provided electronic clearing services based on banks supplying computer tapes which would then be copied to the BACS mainframe computer. While the technology has been updated, most recently using Tandem computers, the basic structure of the service remains largely unchanged. All processing is batch based and the system is constrained by the fact that payment messages are limited to no more than 128 characters, although an extended format, EFS is finally due to be implemented later in 1998. A limited message length constrains the capabilities of the system for making unique individual as opposed to regular payments. The legacies of the BACS process also dictate a delayed three day clearing and settlement cycle. BACS provides three types of payments:

1. *Standing orders* – An instruction to make a regular fixed payment (such as an installment on a loan or investment policy).
2. *Customer credit* – A credit made to a customer account. Customer credits consist primarily of wages and salaries paid by businesses, as well as a number of Government related payments (e.g. State pensions, social security etc.). The percentage of employees being paid by BACS customer credit has increased substantially over the past twenty years. In 1976 this method of wage/salary payment only ac-

counted for 26 % of the total compared to 71 % in 1996. Conversely, wages made in cash now only represent 15 % of the total compared to 58 % in 1976.

3. *Direct debit* – A pre-authorized debit on a customers account which can be initiated by the entity (i.e. the payee) which is due to receive payment. It is a highly efficient method of payment that has grown dramatically over the past 10 years. It now represents 58 % of all BACS transactions compared to 44 % in 1986. Its operation depends on the trust and confidence which customers have in the safeguards that are provided and in the integrity of the payee. It is largely used to pay utility bills (gas, water, telephone, electricity) as well as other forms of regular but variable payments.

Finally, a look at credit and debit card transactions. These each amounted to 1.1 billion and 1.5 billion transactions respectively. In the UK, credit cards were first introduced in 1966 while debit cards were introduced in 1987. Debit cards now account for 60 % of all card payments. Over 83 % of all UK adults now hold either a credit or debit card. There are presently 97 million cards in issue. Total card purchases amounted to 2.6 billion transactions in 1997. However, while growing in importance, both debit and credit card payment transactions still represent a relatively small proportion of all non-cash payments by value (£144 billion). This figure compares with the £489 billion in cheque payments alone which consumers make each year.

In contrast to the mostly paper/cash based payment methods which services the non-financial sector, is a sophisticated, electronically based, same day settlement system that is closely monitored by the Bank of England. This system is called CHAPS (Clearing House Automated Payment Systems) and was established in 1984. CHAPS is a highly secure electronic network that provides nation-wide credit transfers for same day UK sterling payments. It operates using what are now relatively dated X.25 protocols and a dedicated proprietary network provided by British Telecom. The CHAPS network links its 17 direct members and the 400 CHAPS participants, all of which

are major international banks. It handles all the very large value payments within the financial system but also associated smaller amounts (for example interest and fees payable on loans) linked to underlying financial transactions. In 1997 CHAPS accounted for only 14 million payment transactions, equivalent to an average of 60,000 per day and around 0.03 % of the individual payment transaction total. However, if the total monetary value of these payments are taken, then the figures are almost effectively reversed. CHAPS payments in 1997 were equivalent to £600 billion per week or £36 trillion per year. These numbers completely dwarf all the other payment methods combined, representing around 91 % of the total.

4. Servicing the Payment Requirements of the Economy

The different elements of the UK payment system service the particular requirements of different constituencies and sectors of the economy. Payment requirements can be split into four general groupings.

1. *The financial sector:* This has specific requirements for same day settlement of large value payments.
2. *The business sector:* This has to make payments to trade purchasers and trade suppliers as well as to its employees.
3. *The personal sector:* This comprises individuals and consumers who need to make payments for the purchases of goods, payment of regular obligations (such as electricity payments, mortgage installments, life insurance policies etc.) and certain inter-personal transfers.
4. *The public sector:* This has to make payments to trade purchasers and suppliers, employees and to the very large number of recipients of various state benefits.

4.1 The Financial Sector

The payment requirements of the financial sector to a large extent define the architecture of the system as a whole. Although only accounting for 0.3 % of the total number of payment transactions, CHAPS dominates in terms of monetary value, with around 91 % of the total.

Each CHAPS member uses special CHAPS Gateway software for their connection to the main system. In order to make a payment, a member transmits a message which is then forwarded by the system to the Bank of England for settlement. Once settlement has occurred a message is sent back to the CHAPS member and the whole message is forwarded to the CHAPS member/participating bank. In this way, a receiving bank obtains a pre-settled payment. Since the payments handled are so large, special settlement procedures in the form of RTGS (Real Time Gross Settlement) have had to be instituted in order to avoid the dangers of system failure.

RTGS was introduced in April 1996. It involves each CHAPS payment being settled in real time across Bank of England settlement accounts. This prevents the problems which are associated with the previous system of "netting". Netting involved adding total incoming and total outgoing payments and settling the net difference at the end of each working day. Netting has the potential to create unacceptably high intra-day exposures to other counterparties. This can create the potential for system failure as even the largest financial institutions exceed certain previously agreed exposure limits. However while addressing certain key risk issues, the introduction of RTGS and the system requirements of CHAPS as a whole, have increased its unsuitability as an electronic payment system for lower value amounts.

Other payment requirements include the need to pay salaries and meet trade payments. The UK financial sector accounts for a large percentage of the UK workforce which almost exclusively receive payment by direct debit using the BACS system. Payments to trade suppliers will typically be made by cheque or bankers draft.

4.2 The Business Sector

Despite the existence of BACS since 1968 and the creation of CHAPS in 1984, the UK business sector remains predominately a user of paper cheques for making business to business trade payments. At present over 65 % of business to business payments are made by cheque. Given the needs of the financial sector it would in any event be impractical to switch large vo-

lumes of business payments to the CHAPS payment network. While the business sector will typically write over 1.1 billion cheques annually, only 15 % of CHAPS transfers are initiated by industry and commerce, numbering less than 2.1 million. Some of these payments represent payments to the financial sector (e.g. payments of interest and principal on loans). Furthermore, the fact that in 1997 the average CHAPS payment amount was £2 million demonstrates that normal trade payments are primarily serviced in other parts of the payment system.

In addition to using cheques, the business sector is also an active user of electronic payment services provided by BACS. The majority of all wage and salary payments are now made using BACS electronic credit. Businesses are also increasingly using BACS to settle trade transactions but while the number of transactions has trebled (from a low base) in the past four years, the rate of transition is still slow. While overall use of paper cheques has declined since 1990 when a peak volume of 3.7 billion cheque payments was reached, business use of cheques is actually growing. In 1996, use of cheques by businesses increased by 4 % compared to the previous year. The proportion of all cheques written by businesses has increased from 30 % in 1991 to 38 % in 1996.

4.3 The Personal Sector

The personal sector uses the widest range of different payment mechanisms. Cash dominates in terms of the volume of individual transactions while BACS based standing orders represents the largest payment category by value. Consumers have become increasingly sophisticated in switching to non paper based payment methods. Unlike the business sector, the use of personal cheques has been sharply in decline since 1990. Payment transactions that previously involved payment by cheque have been steadily replaced by debit card transactions which have grown dramatically at a compound annual rate of 37 % from 192 million transactions in 1990 to 1.27 billion in 1996. Similar, cash acquisition using ATMs has also steadily increased. In overall terms, non-cash methods of payment have increased to encompass 23 % of all individual transactions in 1996 compared

to 4 % in 1976.

A small minority within the personal sector in the UK has started to make purchases using the Internet. To date, trading has been restricted to a limited number of niche areas including travel, books, CDs and some publications. Payments are predominately made using credit cards although debit cards are also used in certain circumstances.

4.4 The Public (Government) Sector

Given its proportionate share of economic activity, the Government sector makes extensive use of all the key elements of the payment system. Very large payments are effected using CHAPS while BACS is used extensively to make credit transfers. Cheques also continue to play an important role when payments are made by local and central Government to the business sector. Wages and salaries are predominately made using BACS based electronic credits.

Although various initiatives have been taking place to switch to electronic means of payment, a very large proportion of payments, specifically pensions and social security benefits continue to be made in cash. A new Benefits Card was introduced in 1996 aimed at slowly replacing the existing cash based system. At present recipients of benefits receive a giro cheque or benefits book which entitles them to draw cash from any post office. The current method of paying benefits constitutes a significant component of the overall cash based payment system. It requires a massive logistical operation whereby cash spent in the retail sector is recycled to Post Offices so that it can be used to pay unemployment, social security, pensions and other forms of state benefit. The new system that will be introduced will gradually aim to convert these cash payments to electronic credits made through the BACS system. As well as saving significant costs, the new system is intended to reduce the level of fraud.

5. Internet Payment Systems

There is evidence that there is an increasing volume of goods and services which are being traded electronically on the Internet. Although there have been various initiatives to create new payment systems, the purchase and sale of

goods is predominately handled within the context of the existing payment structures. The volume of merchandise currently being traded on the Internet in the UK is estimated at around £500 million per year. This is still a very small figure compared to the overall turnover of consumer goods sector of the economy. The level of business taking place on the Internet in the UK is still too small to be registered by standard surveys carried out on consumer expenditure. The practical reality of trading on the Internet in the UK requires the majority of purchases to be either pre-funded (i.e. funds are transferred separately to an account which can then be debited) or for payment to be made using a credit or debit card. Some initial reluctance to provide credit card details on the Internet is now giving way to a realisation that the SSL security standards already built into the standard Internet browsers provided by Microsoft and Netscape, may be adequate to prevent most direct fraudulent use of card details.

Nevertheless, credit and debit cards experience a number of limitations that prevent them from offering a universal payment mechanism for the Internet. The key issues are as follows:

1. Firstly, the transaction charges are relatively high, particularly for smaller payments. Credit cards charge an ad valorem amount which reflects the specific arrangement with the seller. In the UK, the charge may be as high as 3-5 % of the face value of the transaction.
2. Secondly, only accredited merchants can process card payments. Businesses seeking to sell their goods and services must first satisfy the requirements of the merchant acquirer who will be responsible for processing payments. Merchant acquirers take certain risks in accepting new customers and therefore will exercise their right to refuse an applicant.
3. Thirdly, while credit and debit card usage has significantly increased over the past 10 years, there is still a significant proportion of the UK adult population (17 %) which does not hold either a debit or credit card. Furthermore, credit card issuers have historically been reluctant to issue cards to individuals which do not meet their requirements. Since Internet payments are predo-

minately credit card rather than debit card based, this further restricts the available customer pool. In 1997, 58 % of the UK adult population did not have a credit/charge card.

A number of new pilot programs have been initiated for new payment methods on the Internet. These include various types of smart card initiative, experiments with electronic-cash systems as well as the development of new types of security to prevent credit/debit card details being used fraudulently. The following section provides a summary of the key initiatives to date where they are relevant to the UK:

The ICC Project: The ICC (Integrated Circuit Card) project involves the creation of an integrated credit and debit smart card which can also be used to withdraw cash from ATMs. It involves creating a new standard that will expand the degree of functionality which is available and that will be more effective at preventing fraud. The ICC project is a co-operative project which has been running for 3 ½ years. It includes banks that are members of APACS, several credit card schemes, two ATM suppliers, three EPOS (Electronic Point of Sale) terminal suppliers and four producers of credit cards. Public trials of the newly designed cards started in October 1997 and are due to finish in 1998. The trials involve over 100,000 smart cards and 450 terminals in two pilots taking place in Northampton and Dunfermline. When the trials are completed, individual APACS members will be able to decide how quickly the new cards are to be introduced and what specific additional services should be included on each card. The new smart card standard is primarily aimed at fraud but has the potential of incorporating additional services including Internet related payment systems.

BACS PKS Project: In conjunction with its plans to provide EFS (Extended Format Service), BACS is presently planning a pilot for the PKS (Public Key Security) service that is designed to improve security for banks and other organisations that use the BACSTEL network. BACSTEL is dial-up telecommunications network which is used to send computer files containing electronic payment instructions to BACS. Prior to the creation of BACSTEL, these files were sent on computer tape which

was delivered by courier to BACS offices. BACSTEL accounted for 93 % of all submissions in 1997 and from the beginning of 1999 onwards, all submissions must use the network. BACS also hopes to develop new services as a result of the pilot that will give it the opportunity to develop its role as a provider of trusted third-party services over the Internet.

CHAPS Euro: This is a new electronic same-day electronic payment service that is being developed jointly by CHAPS and the Bank of England. The developments for this service are well underway and it will be launched as a live service on 4 January 1999. CHAPS Euro provides the same large value payment settlement services as are currently available for Sterling payments using CHAPS. The service will also be based on RTGS via accounts held with the Bank of England. CHAPS Euro is being actively marketed to European banks as an effective solution to their needs, once the Euro is established in January 1999. CHAPS Euro will permit connection to S.W.I.F.T., the proprietary international messaging services that allows member banks to send cross-border payment instructions to each other. A number of new members have joined CHAPS, solely to have access to the Euro same day settlement service. CHAPS Euro is intended to provide international banks operating in London with the infrastructure which they require to process Euro large value payments. However, its usage will therefore effectively be restricted to the financial sector in the same way as CHAPS Sterling.

Mondex Smart Card: Mondex has been in development for more than eight years and was a project that was initiated by National Westminster Bank (NatWest). Mondex involves creating a secure smart card that can hold cash electronically and be used to make small value payments that would otherwise involve payments in coins and/or notes. Its main attraction is replacing the billions of small value cash payments. Unlike other smart card initiatives like GeldKarte in Germany, Mondex was designed from the outside to provide complete anonymity to its holder. Using a Mondex card involves using special card readers that can be linked via a telephone line or ATM to the holder's bank. Money is then downloaded on to the Mondex card and can then be spent at those retail locations which have the equipment to

read the cards and ultimately transfer any money received to another bank account.

Given its design, Mondex permits money held on the card to be transferred to another card directly. This is a unique feature compared to other smart card initiatives. In effect it permits a form of direct payment transfer for small value amounts which does not require the intervention of a bank clearing system. Mondex have announced plans to utilise this particular feature for making secure payments over the Internet. A card holder would need to have a special reader linked to a PC which could then transfer cash amounts from the card to another card + reader linked to a different PC. In December 1996, it was announced that MasterCard would take a 51 % stake in Mondex. In effect, Mondex has become MasterCard's technical solution to providing an electronic cash smart card which competes directly with initiatives to create VisaCash by the Visa credit card organisation. On 26 February 1998, Mondex announced the first successful trial international electronic cash transaction. Mondex continues to operate different trials both in the UK and in a number of other locations internationally. Large pilots are being conducted in New York, Hong Kong and Guelph in Canada. The majority of work associated with these pilot programmes is intended to test the ability of the Mondex card to substitute for face-to-face cash payments made to retailers. Some unspecified ongoing work is also associated with its capabilities for making peer-to-peer digital cash transfers.

The Mondex consortium have had some degree of success in licensing Multos, the operating system which underlies the Mondex card. A new grouping called Maosco Ltd has been formed to promote Multos as an open standard. In February 1998, a group of 12 companies involved in the development and manufacture of smart cards including Gemplus and Schlumberger made a commitment to supply smart cards based on the Multos operating system.

CyberCoin Electronic-cash system: CyberCash is a US based company that has been attempting various approaches to creating new forms of payment that can be used to transact Internet commerce. CyberCoin is designed as a Java application that will reside on an Internet seller's web-site. Purchases would require first

establishing an account with CyberCash with the relevant credit card, bank account or debit card details. This would then permit small value purchases to be made that would in turn involve reimbursement by CyberCash and more infrequent debits to the credit card, debit card or bank account specified by the CyberCoin account holder. CyberCash recently launched a bid to acquire ICVerify. ICVerify has also developed complementary credit card based Internet payment systems. If the bid becomes effective it will expand the existing network of potential companies prepared to accept micro-payments from 3,000 to more than 250,000. CyberCash is conducting unspecified trials of its CyberCoin system in the UK as well as in Germany, Japan and the US. A number of US retailers are using CyberCash including large retailers like Macy's.

SET (Secure Electronic Transaction Protocol): SET was an initiative which was begun by MasterCard and Visa. Its aim was to provide a secure form of sending credit card details over the Internet using proprietary encryption. IBM has become a strong supporter of the proposed standards with 50 customers piloting a number of different schemes around the world including the UK. There have recently been some doubts expressed regarding the long-term viability of SET given that SSL (Secure Sockets Layer) has already provided the basic security requirements necessary for electronic commerce to start to emerge. SET continues to figure prominently in attempts to create secure business to business payment systems based on the Internet. Although its original purpose was to ensure secure transmission of credit card details, its longer term application may well be to ensure secure electronic trading between individual companies linked in supply chains.

Europay SCCP: In February 1998, Barclaycard, the largest issuer of credit cards in the UK announced that it was undertaking a new trial involving Europay International's SCCP (Smart Card Payment Protocol). The trial will involve staff employed by Barclaycard making purchases on the Internet using SCCP at a specially created kiosk.

Ice.com VPS System: A new UK start-up company, Ice.com has launched a new payment system, VPS (Virtual Payment System) for low value transactions on the Internet. In effect

ICE.com operates as a secure third part payments agent. VPS operates in a similar way to a number of other small value systems. Individual users are required to open an account and provide their credit card details. VPS has signed a contract with Royal Bank of Scotland as Merchant Acquirer as well as with Dialog Corporation, one of the largest providers of on-line electronic information.

VisaCash Smart Card: VisaCash is an alternative smart card technology to MasterCard's Mondex being developed and promoted by Visa. It is involved in a number of pilot studies around the world. Current test sites include Taiwan, Norway and Sydney as well as the UK. Unlike Mondex which is based on a proprietary operating system, VisaCash is based on the Java programming language developed by Sun Microsystems.

6. Discussion and Conclusions

The new initiatives which are underway and that are seeking to test various new concepts for payments are therefore numerous. However, it must be emphasised that various trials and pilot programmes have been taking place for a number of years. For example, certain smart card initiatives aimed at replacing small cash payments have been under discussion for ten years or more and smart card technology itself is as old as the PC. New pilot programmes often create a certain level of excitement and interest in the media. They are seen as useful additional publicity which serve to identify the relevant financial institutions as being at the forefront of technological developments. The banks and other financial institutions that are sponsoring these projects often view them as a form of insurance against being caught unawares by developments in this area. For some initiatives, partial implementation may be considered providing that the project can be scaled up in stages. This means that the associated business risks can be controlled by building up the project on a step by step basis. In reality, major commercial banks already have significant investments in the existing structure of the payment system. They are likely to be wary of introducing new initiatives which may simply serve to increase their cost base without generating incremental revenue.

A number of the new initiatives offer exciting possibilities for the future. In particular, the Mondex card has the potential to offer an effective alternative to using cash for small payments as well as a means of transferring small value payments over the Internet. However, actual implementation of new systems will need to overcome a number of obstacles, which include some of the following:

1. Firstly, the experience of technological development in payment systems in the UK demonstrates the complexity of technological change in this area. The key changes that still need to take place are largely institutional and organisational in nature rather than technically based. The advances in micro-electronics that permit payment information to be communicated and processed securely in electronic form are more than 25 years old. For example, BACS was established in 1968 and accounts for by far the greatest number of individual electronic payments in the UK. While usage has grown dramatically in the intervening years, the basic core technologies remain basically unchanged.
2. Secondly, payment systems cannot be isolated from the complex, often highly personal business/consumer/personal transaction of which they form a part. This point is clearly illustrated by the predominant use of cheques by UK businesses for settling trade payments. An electronic, lower cost alternative has been available for 30 years. However, businesses prefer the paper based alternative since it fits existing organisational routines, gives greater control over when payments are actually made and because they often lack the competencies which are needed to manage an electronically based system.
3. Thirdly, financial institutions have experienced the impact of what can be described as "competitive technology pull". They may therefore be resistant to change for sound economic reasons. The implementation of ATM technology to facilitate more flexible cash acquisition provides a good demonstration of this effect. Banks initially welcomed ATM technology as a way in which they could automate certain banking

services. Banks then discovered that with an initial investment cost of £20,000 to £30,000 and annual operating costs of a similar magnitude, an ATM only represented an economic investment if it could generate at least 5,000 to 8,000 transactions per month. The result has been that ATMs have added to, rather than displaced part of the overall cost base. ATM withdrawals have been growing at faster rate than new installations. However, it was only in 1991 that an average volume of 5,000 transactions per month was achieved. The average UK ATM currently receives 6,500 transactions per month, ensuring that ATM networks continue to represent a valued customer service rather than offering more tangible financial returns.

4. Fourthly, there is immense inertia in the current system. The percentage of adults in the UK with a bank or building society current account has slowly increased from 44 % of the population in 1976 to 83 % in 1996. With over 37 billion individual payment transactions each year, 76 % of which relate to cash, there are identifiable obstacles to making any significant impact on the current system. This point is illustrated by the issues that have to be considered when and if the Euro becomes the established currency and all existing notes and coins have to be replaced. APACS estimate that £22 billion of bank notes and coins worth £2.6 billion and weighing an estimated 100,000 tonnes will have to be withdrawn from circulation and replaced with their equivalent in Euros.
5. Fifthly, there are growing doubts about the business model for micro-transactions that has driven much of the development of new Internet payment technologies. New start-up companies like CyberCash and DigiCash originally had great expectations for creating new small value payment systems on the Internet. However, consumer acceptance has been muted. In practice, the US experience suggests that consumers prefer to pay indirectly through advertising or by subscriptions to services that give them unlimited access. Content providers have quickly discovered that micro-transactions can quickly upset their best custo-

mers who feel that they are being penalised at the expense of the infrequent selective customer that gets the service at a very low cost. Many of the more recent initiatives in micro-payments simply provide aggregation of small amounts that then have to be settled by credit card anyway. If the business model for micro-transactions is not viable, then it is unlikely that there will be the same requirement for the associated small value payment systems.

Note

- 1 Details of UK payment statistics have been obtained from APACS (The Association for Payment Clearing Services) which publishes a number of documents which are listed in the bibliography. APACS is an association made up of 23 Full Members and 19 Associate Members. Its membership comprises all the major UK banks as well as a number of international banks which include Deutsche Bank AG, Credit Lyonnais SA and Citibank N.A.

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