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Electronic Payment Systems

– Strategic and Technical Issues –

Background Paper No. 1
Electronic Payment Systems Observatory (ePSO)

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Abstract

The first Background paper of the Electronic Payment Systems Observatory (ePSO) identifies the strategic and technical issues that will be discussed in the ePSO Forum – an online discussion group consisting of payment systems experts and a broad range of market players. The discussion will concentrate on electronic retail payment systems - focussing on the needs of consumers, merchants and SMEs. While in principle all electronic retail payment systems will be analysed, special emphasis will be given to payment methods in the context of electronic commerce on the Internet and the development of cross-border payment systems. The issues that have been identified are grouped around eight broad categories: e-money, enhanced access products, micropayment solutions, payment systems infrastructure, regulation and innovation, standardization and interoperability, consumer protection, anonymity, privacy and security and integration of payments into online transactions. Some of the major issues are:

- the availability of reliable data that are comparable across different countries
- the impact of the EMI Directive and its implementation on payment systems innovation and the position of Europe in the field of global competition
- the relationship between interoperability and standardisation and the role of bridging technologies
- the potential for competition between bank-based payment networks and other networks (e.g. mobile phone networks)
- the effects of cheaper and faster online connections on the demand for off-line payment solutions
- the provision of privacy and security at reasonable cost and the possibility of offering different trade-offs between costs and security
- the implications of a functioning PKI for the various electronic payment schemes
- feasibility of transaction-based micro-payment systems and the potential market for such solutions
- new access products and the position of banks vis á vis non-banks in payments
- current changes in the payment system and the effects on the bridging of the gap between cross-border and national payments
- ownership of multi-application smart cards (the financial industry, the government or the individual)
- payments in the wider context of shopping protocols and browser standards.

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1 INTRODUCTION

1.1 ROLE OF THE BACKGROUND PAPER

This first background paper aims to structure the strategic and technical issues that will be the focus of the electronic Payment Systems Observatory (ePSO). Further background papers will be devoted to selected issues of this agenda. All background papers are reviewed by the Steering Group. The revised versions will be distributed to the ePSO-Forum where payment systems experts and a broad range of market players are invited to further discuss the issues raised. These discussions will be led by the ePSO-team. The project's newsletter ePSO-N, which addresses the same issues, prepares the ground for the production of ePSO-background papers and helps stimulate discussion in the Forum (for example issues 1 & 2 of ePSO-N focussed on mobile payment systems - a likely topic for the next background paper).

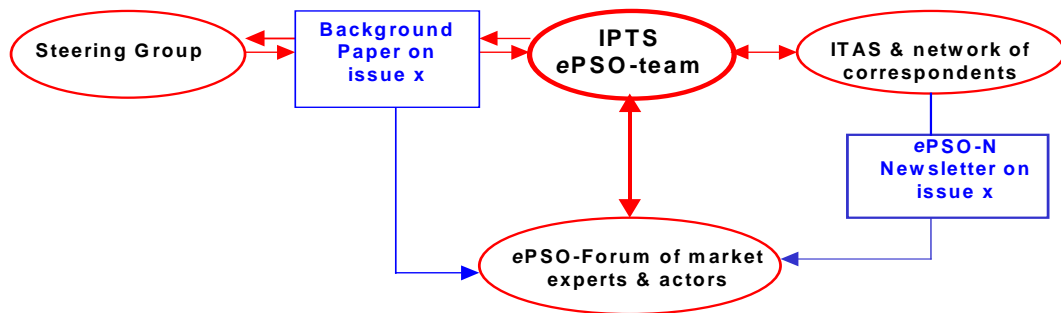


Figure 1: Background Paper in context

1.2 SCOPE OF THE ISSUES

The project's scope is limited to **electronic retail payment systems** focussing on the needs of consumers, merchants and SMEs. While, in principle, all electronic retail payment systems will be analysed special emphasis will be given to payment methods in the context of **electronic commerce on the Internet** and the development of **cross-border** payment systems. Important topics such as B2B e-commerce or developments in other continents are beyond the scope of the project. Nevertheless, as far as they affect the issues covered by ePSO, they will be taken into account.

We suggest exploring and discussing eight major issues that may be grouped as follows:

- ❑ e-money
- ❑ enhanced access products
- ❑ micropayment solutions
- ❑ payment systems infrastructure
- ❑ regulation and innovation
- ❑ standardisation and interoperability
- ❑ consumer protection, anonymity
privacy and security and
- ❑ integration of payments into online
transactions

The first four issues deal with different types of payment systems and their corresponding infrastructure. The analysis however is not system-oriented but procedural and issue based. Attention will be paid to topics such as innovation and differentiation of payment methods, the competitive position of new e-payment products like e-money vis à vis more traditional access products and cash, usage patterns for given payment methods in real world situations, and competition and co-operation with regard to infrastructure.¹ Apart from e-money schemes, dedicated micropayment systems have been developed to handle payments of small amounts² on open networks in a cost efficient way. Microbilling and indirect revenue streams also need to be considered as alternative solutions for the micropayment problem of electronic commerce, i.e. trading low value intangible products and services and getting paid.

The remaining four issues are related to the broader framework in which payment systems operate, which is characterised by the demands of different actors who shape and constrain the corridor of future retail payment systems. Special attention will be paid to the requirements set by policy makers, merchants, SMEs and consumers. Regulation and innovation correspond mainly to policy making. Issues such as privacy, anonymity, security, ease of use, and consumer protection are naturally related to the consumers' point of view and the integration of the payment functions in online transactions is especially important for merchants and SMEs. It goes without saying that standards and interoperability are of interest to all parties involved.

Before going into detail concerning the strategic and technical issues, we try to set the scene by offering **a more general framework** to better understand the actual transformation of the whole payment system and our selection of issues.

¹ The distinction between access products and e-money used here goes back to the 1996 definition by the Bank for International Settlements: "E-money products are defined here as 'stored-value' or 'prepaid' products in which a record of the funds or 'value' available to a consumer is stored on an electronic device in the consumer's possession. ... E-money as just defined differs from so-called *access products*, which are products that allow consumers to use electronic means of communication to access otherwise conventional payment services..." (Bank for International Settlements 1996, p 1).

² Where 'small' can be anything between a fraction of a Cent and a few Euros.

2 PAYMENT SYSTEMS TRANSFORMATIONS – A MORE GENERAL FRAMEWORK

2.1 INFORMATION SOCIETY

Globalisation, liberalisation, deregulation (or: re-regulation), digitisation and informatisation are causing a shift from the traditional industrial society to a knowledge or **information society**. Payments can be interpreted as a highly specialised mode of communication. Such a statement would be true even without the existence of the Internet. The advent of electronic commerce, however, has meant that retail payment systems must cope with new requirements. In our view, there are three obvious challenges:

- a) the **integration of the payment function** into e-commerce procedures overall (shopping and more),
- b) the efficient management of (global) **cross-border payments**
- c) the handling of **high volume/low value payments** for the purchase of intangible goods and services.

2.2 POLITICAL DIMENSION

The parallel process of European integration explicitly stresses the **political dimension** and gives high priority to the development of harmonised retail payment systems in both the real and the virtual world (e.g. cross-border credit transfers within EU, e-money settlement cross-border). The juxtaposition of political and technical transformation processes can also be seen as a window of opportunity because European integration at the level of payment systems requires technological innovation and implementation of applications for cross-border e-payments. The European Parliament and the European Commission are aware of this challenge (hence the eEurope initiative, the establishment of FIWG, the Financial Issues Working Group, recent research projects like SEMPER, the SmartEuro projects, and relevant directives addressing e-money, distance selling, digital signatures, e-commerce). Considering the enlargement countries and transition economies these challenges are growing.

In the light of globalisation, **Europe-wide solutions are not enough**. They should be exportable. The question is how European solutions can succeed internationally. Although European leadership in e-payment services is generally taken for granted, threats from abroad should not be underestimated. It is also worth mentioning that

globalisation should not be interpreted as implying the existence of only one solution. The opposite is true. It was never as difficult as today to find the **right balance of local, regional, national, trans-national and international solutions**. Attempts by payment systems to achieve global reach coexist with other schemes aimed explicitly at local environments. The different geographical levels also require a rethinking of the **different mixes of the payment function and added value functions** (loyalty points, ticketing, digital signature etc.). In addition, it is safe to say that **payment culture matters** and has to be taken into account.

2.3 OPEN NETWORK INFRASTRUCTURE

The Internet as an open network infrastructure has several implications for the way electronic payment systems function. As with all truly integrated computerised value chains, the end user is now the front man of the back-office. The shift to Internet technologies by the banking sector also means that **proprietary technology becomes more and more obsolete** (as evidenced by the substitution of a specialised POS-terminal infrastructure by mobile phones and GSM network). The move to mainstream technology also signals another far-reaching innovation of the whole back-office computation: the gradual substitution of batch processing by real-time transactions. Another notable change can be observed with respect to the technological arms of the payment service providers. While these so-called network operators (often only one organisation in a given country) worked in close relation with the banking sector, this has changed with Internet payments services. **The operators of private networks that were once hidden now appear as service providers on open networks in their own right**. The Internet has increased competition between banks and non-banks, and has also enabled many forms of co-operation and fruitful division of labour in the field of payment services.

2.4 ELECTRONIC PAYMENT SYSTEMS – THE SECOND WAVE

The lack of success of e-money schemes – in the real and virtual world – is an ongoing topic of debate. The same is true not only for micro-payments (e.g. eCash, CyberCash, Millicent, MiniPay, First Virtual etc.) but also for many new payment mechanisms that have been developed for **payments on the Internet**. So far, traditional payment instruments (**access products**) have been more successful on the Internet. However, attempts to make them safer by security measures like SET (Secure Electronic Transaction) have not taken off as anticipated. **The current development in e-payments, however, is characterised by new efforts to overcome misconceptions and failures in**

a second run (e.g. server based wallets, virtual cards, mobile phones as user-friendly and secure interfaces). Furthermore, the picture is made more complex by the wealth of payment methods being linked to an increasing number of communication channels which can be used for electronic payments, i.e. POS transactions and e-commerce. **M-payments by mobile phones especially are important for both the virtual and the real world.** The different channels for online-shopping like WAP access to the Internet or digital TV, however, also have some potential.

The more the payment business becomes a mere matter of digital information exchange, the more the core competencies change. When **the use of a payment instrument is equivalent to the use of software**, then application development and human factors become vital for the success of electronic payment systems. The perception of payment methods as secure, user-friendly application software leads also to **the vision of a homogenous payment software that allows all payment methods to be used easily**. Each payment instrument would be but one function of the payment application to be further specified by additional features. At the same time computer technology promises to make the technology of payment instruments like cheques, credit transfer or direct debit obsolete.

2.5 ELECTRONIC CASH AND CASHLESS SOCIETY

The new developments also require **a rethinking of cash** and the vision of a cashless society. In the sixties some of the drawbacks of cash became apparent and the vision of a cashless society built on electronic means of payment emerged. But it took a long time – more than 15 years – before new retail payment instruments took off, and even now cash is by far the most popular retail payment instrument, partly due to the fact that **costs of cash are not visible to the customer**. Electronic methods will have to prove themselves to be convenient and effective in a lot more real world situations if they are to win a greater market share from cash. With respect to e-commerce, an important question is whether there is demand for **an electronic payment instrument with the properties of cash**.

3 STRATEGIC AND TECHNICAL ISSUES

3.1 E-MONEY

The future of e-money, now that initial enthusiasm has waned, is assessed much more cautiously than it was, even a year ago. It is no longer taken for granted that there is a business case for a stand-alone e-purse scheme or purely software-based solutions. Careful analysis of whether e-money is economically viable is therefore needed. Consideration has to be given to whether this analysis will have to be modified in the light of expected technological changes. Policy issues can then be identified.

3.1.1 The business case for e-money

a) In the real world: point-of-sale (manned or unmanned). There is widespread agreement that e-purses are more efficient than cash at the unmanned POS (vending machines, parking meters, public phones, ticketing, etc.). The business case for e-purses is less clear at the manned POS. So far, there has been a noticeable lack of enthusiasm among merchants and consumers. This is partly due to competition by other payment instruments. The main competitors are cash and debit cards. For small and medium sized transactions, customers and merchants still find cash convenient and cheap. For larger purchases, debit cards or credit cards seem to be superior to e-purses for a number of reasons (e.g. loading limits for security).

b) In the virtual world. The comparative advantage of e-money is seen mainly in the area of micro-payments. Currently, there is no generally accepted and cheap means of paying for relatively low value goods. This is seen as a major drawback for e-commerce because it is often believed that the Internet provides a huge market for low value goods, such as single newspaper articles, music, cartoons etc. Further demand for flexible payment schemes is expected from mobile services such as “location-sensitive” information, etc. E-money competes with a large number of other methods. In the virtual world, credit cards, electronic direct debit, operator billing and all kinds of aggregation schemes compete with e-money. Furthermore, in many transactions, old methods such as subscription and payment on delivery (or even payment after delivery) can be used.

3.1.2 The business case for multi-application cards

One way to strengthen the business case for e-purses is to use smart cards for a number of different functions. A new generation of smart cards that allows the implementation of various applications (‘multi-application smart cards’) is reaching

the market. Such cards have the advantage of spreading costs over many applications, thus enhancing the business case. They also reduce the number of cards a customer has to carry – an important point for cardholders. The drawback is that a move to multi-application cards increases problems such as co-ordination, standardization, security, branding and liability. Agreement no longer has to be reached within industries but across industries.

3.1.3 Long-term effects of innovation

At present, it is not clear how e-money will profit from technological advances. With respect to security, there is a trade-off. On the one hand, the price of chip-based computing power can be expected to fall. This by itself should make e-purses safer and cheaper. On the other hand, cheaper computing power will also benefit those who try to attack the system. Whether new solutions such as voice-recognition or bio-metric systems will provide efficient means to improve security remains to be seen. It is evident, however, that the falling prices of information transmission will make online transactions cheaper. This implies that competing technologies such as the debit card will become more competitive vis-à-vis e-purse payments. Indeed, it has been argued that the low usage of e-purses in the US can be explained by the low telecommunication costs in the US. Thus, innovation may also work against e-money. However, smart cards in general will profit from innovation because technical progress widens the set of applications and makes it easier to implement multiple applications on one card.

Issues

- The availability of reliable data, as well as missing data in many cases, constitutes a problem area. Moreover, even if data on e-payments do exist, they are often not comparable across different countries. Thus, an important issue is to identify sources of data and types of data that are needed by policy makers and market players.
- What effect will cheaper and faster online connections have on the demand for off-line payment solutions?
- If smart cards offering payments as a stand-alone function are not viable, the way forward may be multi-application smart cards. A move towards multi-application smart cards would create complicated problems beyond technical questions of design. In particular, questions such as ‘who owns the card and thus controls the relationship with the customer?’ would have to be answered. If cards offer payment functions, financial institutions will wish to remain in charge. However, customers will be

concerned about data protection and privacy and may be reluctant to surrender ownership of a card that stores a wide range of confidential information. In addition, governments may demand ownership of smart cards that serve as a substitute for today's IDs and passports.

- Multi-application smart cards also make it harder to find cross-border solutions since it is unlikely that local ticketing solutions etc. will all be compatible. Furthermore, the more functions are stored on a card, the less willing customers may be to take such a card with them when they are travelling.
- To what extent should multi-application smart cards be regulated? If a health insurer teams up with a public transport company to issue a smart card that can also be used for low-value payments, do they fall under the e-money directive?

3.2 ENHANCED ACCESS PRODUCTS

In the past, innovations in the payment system almost always enhanced the efficiency of account-based forms of payment. With the emergence of products such as eCash and Mondex this trend appeared to be reversed. New, seemingly unaccountable forms of payment entered the stage. These forms of payment appeared to be ideally suited for the Internet, in particular for low-value or micro-payments. However, they failed to pass the market test. Furthermore, new accountable schemes are currently being implemented to make secure and low-cost transactions possible. Virtual cards or wallets and pseudo numbers are designed to reduce the risk of sending account information over the Internet, without having to use a cumbersome and expensive process to secure the data transfer. In addition, with falling costs of data transmission, real time online giro transfers have to be considered more and more as a plausible solution for the future. In the evolving area of m-payments most of the existing schemes rely on access products that allow bank account holders to use their deposits to make payments.

Access products have not just been enhanced but also combined with other services. Thus, home banking offers the possibility of initiating credit transfers with a whole range of other financial services. Electronic Bill Presentment and Payment (EBPP) is another example of this bundling of services.

Issues

- While it is possible that the payment system will change in fundamental ways, one may have to contemplate the possibility that the ultimate payment system will look

more or less like the current one. The only difference will be that people will access their bank accounts via the Internet, phone or mobile phone and they will no longer have to wait for days until a payment is cleared and settled. Enhanced access products provide new business opportunities for banks and non-banks. The question is whether they will ultimately allow non-banks a larger role in payments.

- The combination of e-payments with other services implies that the evolution of e-payments may be shaped by developments in these areas. In particular, advances in home banking and bill presentment may influence the evolution of e-payment methods and standards.

3.3 MICRO-PAYMENTS

It is often assumed that there is an enormous potential for small-value purchases on the Internet. Examples are purchases of software, news items, articles, photos, cartoons, music etc. The main problem for these markets is usually seen in the lack of a convenient, secure and cheap means of payment, in short, the lack of an efficient means for micro-payments. Various attempts have been made to establish such a system but so far there is no transaction-based micro-payment system operating successfully. The question of whether such a scheme is really needed requires further investigation. On the one hand, micro-payments could constitute a catalyst for e-commerce of intangible products and services on the Internet in the sense that property rights, and consequently the improved chances of getting paid, could bring new and better products to the market. On the other hand, the numbers of freely available products in this sector might only allow a niche for paid goods. Often indirect revenue streams (for instance from banner advertising) are decisive for these businesses.

Issues

- In the real world, cash is still a widely used means of payment for small-value payments. Often, these low value payments (ticketing, parking, etc.) are assumed to be one of the most promising uses for e-purses.
- The feasibility of transaction-based micro-payment systems, and their existing alternatives, should be further investigated. At the same time an assessment of the potential market for low priced goods and services on the Internet requiring micro-payments should be made.
- As there are great opportunities in this field for new entrants, a high level of competition can be expected. Micro-payment systems to be watched include prepaid

(“ticker systems”) and post-paid (micro-billing) approaches (sometimes also called “aggregating systems” or “metering systems”). Attention needs also to be drawn to micro-payment schemes based on value points (“private currencies”). In addition, the potential and the limits of competing indirect income models have to be assessed.

- Once again, an important issue is the availability of reliable data on the use of payment schemes such as subscription or indirect income.

3.4 INFRASTRUCTURE

3.4.1 *The role of banks in final settlement*

Traditionally banks have provided most payment services. In particular, they provide the “backbone” of the payment system. Ultimately, non-banks will use the banking system (and occasionally cash) to settle credits and debits. This implies that all payment solutions depend to a certain extent on the efficiency of the payment system run by banks. For the moment, any challenge to the banks’ position in this field is inconceivable. Firstly, only banks have access to central bank credit. Secondly, for many payments, in particular regular payments with known counterparts, direct debits or credits and standing orders are highly efficient and will not be replaced in the near future. Thirdly, banks are still the one institution consumers trust most. Thus, the flow of income payments will remain bank-based.

3.4.2 *Competing infrastructures*

Just like telephone services, payment services are a good with strong network effects. From the point of view of the users the implications are straightforward: the larger the network, i.e. the more people participate in the network, the better for each of them. From the point of view of the suppliers, the case is less straightforward. On the one hand, they profit from an increase in the network because that drives down unit costs and makes it less likely that other networks will be able to compete. However, members of an established network also have an incentive to deny access to other suppliers of payment services since new entrants would increase supply and drive prices down. Thus, there may be an incentive to restrict access to the network for new suppliers in order to restrict competition. For instance, a ‘virtual bank’ that cannot offer its customers access to the ATM network would have little chance of succeeding in the market. To a certain extent, this problem is reduced by newly created competition between networks. For instance, e-purses can also be reloaded, at least in principle, via ‘smart phones’ (including public phones and mobile phones) and via the Internet (using a PC with a card reader). Thus,

nowadays, a new provider of an e-purse scheme is less dependent on access to an ATM network.

Although different payment networks exist (credit card networks, mobile and terrestrial phone networks, the Internet, ATM networks, POS networks), all of these depend to some extent on the banking system. Credit cards can be used as an example - in the end, the cardholder has to transfer funds into the bank account of the credit card company and the credit card company has to transfer funds to the merchant's bank account. Thus, though the use of alternative payment networks and aggregation reduces the dependence on the banking network, it does not eliminate it.

Issues

- Even if there is, to some extent, competition between networks, payments may involve anti-trust issues. Firstly, competition is far from perfect. There are few networks and many of them are dominated by the same players. Secondly, setting up these networks requires co-operation on standards. Such co-operation can easily extend to areas such as fees, where co-operation is likely to be harmful for customers and competitors. However, it is not always clear where to draw the line between co-operation and collusion. For instance, the role of interchange fees still needs further discussion.
- So far, cross-border retail payments are time-consuming and expensive. Banks are trying to make these payments more efficient. The question remains whether these attempts will eliminate the difference between cross-border and national payments.
- Another issue to be addressed is the potential competition by other networks such as mobile phone networks.

3.5 REGULATION AND INNOVATION: E-MONEY

3.5.1 The E-money Directive and its implementation

On 27 October, 2000 the E-money Directive was published in the Official Journal of the European Commission. Member states have until April, 2002 to convert the Directive into national law. The Directive defines the term 'electronic money' and regulates which institutions are allowed to issue e-money. It provides an important framework for all players in the market for payment services and may have a strong impact on the competitive position of European payment service providers. The effects of the E-money

Directive on the future of e-money will largely depend on its translation into national law and its practical implementation. Therefore, at the moment, it is not entirely obvious how the Directive will affect the market for e-payments and the different groups of payment providers.

One of the open questions is how extended loyalty schemes, bonus points and electronic barter schemes would be affected by the Directive. Though such schemes are usually fairly limited in scope, they could potentially grow into an alternative monetary system.

3.5.2 Vertical integration versus increasing division of labour: implications for regulation

At the moment there seems to be a strong drive towards vertical integration. Non-banks such as Telecommunications Operators (TOs), ISPs, supermarkets or software firms are moving into the area of financial services (including payments). At the same time, banks are starting to offer Internet services to their customers. In addition, players from both groups are working on the construction of a Public Key Infrastructure. However, on close inspection, in many cases an increased division of labour can be observed. While a large number of services are often marketed under a single brand – they are in fact produced by specialised firms. Banks have begun to spin-off back-office activities, they outsource IT-functions, they buy software and communication services, etc. Non-banks that offer payment services will often outsource the ‘doing’ to banks.

Issues

- In order to study the impact of the E-money Directive on the future development of electronic payments, questions like the following need be considered: What impact will the Directive have on payment systems innovation? How will the implementation process be shaped in different payment cultures? How does this Directive affect the position of Europe in the field of global competition? To what extent is the Directive applicable to loyalty schemes, barter schemes, etc.? During the Directive’s implementation process, the answers to these questions can provide valuable guidance for member countries.
- The increased division of labour makes money and banking more complex to regulate and supervise because it is now more difficult to decide which institutions should be regulated and supervised. Furthermore, this development suggests that the overall

regulatory strategy should be reviewed. Rather than regulate particular institutions it might be preferable to regulate functions such as payments.

- Can value points develop into private currencies – challenging the current monetary order?

3.6 STANDARDIZATION AND INTEROPERABILITY

There is a strong political commitment to a common “virtual Euro”. However, due to the complex structure of the problem, interoperability of e-payments has not been achieved yet. This implies that different interoperable e-purse and e-money schemes exist side by side – largely along national lines. Many players have established their own systems and do not wish to make large changes (partly because this would upset their customers: merchants and consumers). Given this complexity, an attempt to enforce standardization would entail enormous risks. The success with the GSM standard for mobile phones or DVB may induce regulators to try a similar strategy in the field of e-payments. However, the GSM example is not directly applicable to the payment sector. Furthermore, the shortcomings of HDTV should serve as a warning.

Success and failure of payment instruments can be described in terms of network externalities. Where there is no single dominating actor, positive network effects depend on a certain degree of standardization and interoperability. Standardization seems to be the obvious route to interoperability. It should be remembered, however, that standardisation is neither essential, nor sufficient to achieve this goal. There are many paths to interoperability. A common standard is just one of them. Sometimes a set of requirements allowing interoperability, the development of a “universal terminal” that can cope with different schemes, or the intermediation of payment service providers bridging between systems (e.g. SmartAxis in the case of e-purses) is appropriate. However, none of these strategies is sufficient in itself. Interoperability is not just a question of cards, card readers and the respective software. Interoperability also requires business agreements and a common clearing and settlement system, which may require co-operation between banks and non-banks and across borders.

Issues

- Standardisation and interoperability efforts take place at the level of all types of payment systems. The EMV standard provides the basic requirements for physical, mechanical and electrical compatibility of smart card based payment schemes. This

makes the complex and time-consuming migration to EMV worth while if the use of electronic payment systems is to spread. With regard to e-commerce, work on interoperability of e-purses, which so far has produced the EMV-based Common Electronic Purse Specifications (CEPS), is vital. Achievement of interoperability depends on four critical factors:

- i) *Market demand.* Given the low volume of cross-border retail payments, it is not yet clear if there is a business case for an international interoperable e-purse.
 - ii) *Economies of scale.* Even if demand is small, economies of scale on the supply side might induce operators to find an interoperable solution.
 - iii) *Innovation and exclusion.* Does the scheme agreed upon by major players slow down more advanced technical solutions, and in what way does it influence competition? At worst, standards might be misused for strategic reasons by some actors to exclude others.
 - iv) *Implementation,* since migration to a developed interoperable scheme may be a tedious process.
- Could the use of bridging technologies provide a cheaper and faster way towards interoperability?
 - Normally the standardisation of micro-payment systems is not addressed at the European level, although there are committees at the level of IETF, and W3C. These standards are obviously not banking standards. This raises the question whether there is a lack of European involvement in these standardisation processes. Such concern might be generalised with respect to financial applications of XML.

3.7 CONSUMER PROTECTION, ANONYMITY, PRIVACY AND SECURITY

Currently, many different payment media are entering the market to compete with existing payment schemes in the real and virtual world. This is good news for customers. However, payments have the characteristics of a network good. It remains to be seen whether competition will be enhanced in the long run, as it is probable that sooner or later only a few surviving payment schemes will remain.

The widespread use of cash in the real economy indicates that consumers do value anonymity and do not like to have all transactions “on the record”. Thus, there may be a need for further regulation, protecting sensitive payment data. Shopping and paying on

the Internet make it possible, in principle, to gather large amounts of data and create personal profiles, or, even worse, “identity theft”. However, before further regulation is considered, anonymity and data protection should be seen in the wider context of protection of personal data on the Internet (including the thorny issue of international agreements on data protection). Furthermore, in the case of payments, there may be fairly simple solutions. It is possible to design prepaid payment schemes in a way that provides anonymity.

When considering security issues, a public key infrastructure (PKI) that can provide secure authentication on the Internet is an important step towards secure Internet transactions – including secure Internet payments. It can help build trust (a precondition for flourishing e-commerce), reduce the potential for fraud, ensure privacy and provide merchants with non-repudiation. In particular, lack of trust on the side of potential consumers is often seen as a major problem for the development of e-commerce.

The general implementation of PKI infrastructure and the development of schemes covering the whole B2C business process, from pre-sales to post-sales services, are vital. Both evolve in a type of co-evolution. The building up of an all-purpose public key infrastructure on the one hand and a dedicated infrastructure for the financial sector on the other hand are not independent of each other. Co-ordination may be required to avoid confusion and bureaucratic overheads. If someone has obtained a digital certificate from a credit institution (e.g. applying for SET participation) why should he or she not use it in other fields of society and vice versa?

The creation of a properly functioning PKI is not an easy task. It is not just a question of establishing a hierarchy of trusted centres. All of these centres must demonstrate that they follow secure procedures. Security has at least as much to do with implementation and procedures as with encryption. It has yet to be seen, therefore, whether a vertically integrated world wide PKI is a realistic scenario.

Issues

- Cash-like e-money schemes are technically feasible. They have the advantage of providing a high level of privacy and making person-to-person payments possible. They would, therefore, reduce the data protection problem and provide a high degree of convenience to customers. However, it is still not known how highly customers value these attributes. High-security payment systems are usually more cumbersome

to use and ultimately more expensive than low-security systems. Thus, there is a trade-off between security and costs (time and money). Current experience suggests that customers put a high value on convenience. As a result, such cash-like schemes may not be economically viable. If these schemes fail the market test, the question of achieving a sufficient level of privacy arises.

- To a certain extent, security is a subjective concept. The assessment of security may vary between customers. Therefore, another important issue is whether and to what extent different levels of security can be offered.
- Consumer behaviour may not be guided just by objective measures of risk but also by risk perceptions. Thus, there is a highly subjective component in the whole problem of risk and risk-reduction – an issue that needs further exploration.
- While consumers value privacy, merchants wish to learn more about their customers. They would like to collect and analyse customer data. This raises the issue of how the interests of merchants and consumers can be reconciled. Again, a system that provides flexibility seems desirable.
- Once again, an important issue is the availability of reliable data, especially on fraudulent use of payment schemes.
- On a conceptual level, a unified world-wide PKI seems to be the best solution. However, the question of whether such a system is feasible needs to be addressed. Furthermore, possible alternatives have to be explored.
- The implications of the implementation of a PKI on the various electronic payment schemes still need to be investigated. While it seems certain that smart cards will play a prominent role in such an infrastructure, it is not clear yet how the demand for e-purses will be affected.

3.8 INTEGRATION OF PAYMENTS INTO ONLINE TRANSACTIONS

Last but not least, the payment function cannot be seen in isolation. Banking standards, standards on the Internet, processing of information within firms, and the way the payment function is embedded in more complex business processes also have to be taken into account. From this point of view, the payment system, one element in a chain of exchanges between trading parties, becomes an embedded tool in a larger environment of

business transactions. These include ordering, billing, delivery, offers and receipts as well as the payment process itself. Although the integration of all these steps in an overarching architecture might be more urgent in the B2B-sector than in the retail B2C sector, it is also highly relevant for online-shopping on the Internet. With so many processes involved in a business transaction, the foremost concerns are those of interoperability and harmonised architectures. Standards and architectures have already been elaborated by consortia such as OTP (open trading protocol) or OBI (open buying protocol). There have also been major efforts by the European Commission to foster research in this area, e.g. the SEMPER project which has developed an open security platform for the different modules of e-commerce. However, their role and impact with regard to today's Internet-commerce and their further prospects are still unknown.

Issues

- Obviously one of the developments to be observed is the integration of payment systems into more complex shopping applications. This inevitably raises questions about the main players in this field - the technology providers, and the solutions they offer. What are the levels of standardisation, current and potential? Are there harmonised standards for the whole process or is there an uncoordinated spread of "would-like-to-be" standards? What role do these standards actually play with regard to today's Internet-commerce? Is there a demand or need for government regulation? Given the wide range of activities spread over global markets, which include a large number of processes and players operating under different regulatory regimes, how can policy makers foster the common understanding and development of viable platforms and standards?
- Furthermore, there are at least two hypotheses worth further consideration:
 - i) that the B2C developments in this field largely depend on browser standards, shopping protocols, etc. and
 - ii) that a straightforward development of a legal framework for e-commerce can be assumed and hence online-payments will get less important over time. For example, supposing a legal framework allowing easy online contracting between merchants and consumers existed, the need for immediate online payments would drastically change. Another scenario to consider would be that of a trusted third party payment service acting as a building block in a

developed e-commerce platform which would overcome the instant payment bottleneck.

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