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# Online Payment Systems for E-commerce

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## Working Party on the Information Economy

# ONLINE PAYMENT SYSTEMS FOR E-COMMERCE

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## FOREWORD

In June 2005 this report was presented to the Working Party on the Information Economy as part of its work on factors affecting the development of e-business and digital delivery. It was recommended to be made public by the Committee for Information, Computer and Communications Policy in October 2005.

The report was prepared by Caroline Paunov (consultant) and Graham Vickery of the OECD Secretariat. The series of reports on the development of e-business and e-commerce and the restructuring of global value chains is co-ordinated by Graham Vickery. It is published under the responsibility of the Secretary-General of the OECD.

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## SUMMARY

This report analyses the recent development of online payment systems for e-commerce, covering different payment mechanisms, the extent to which these different systems are used and the implications of industry characteristics and network effects. It discusses drivers and impediments to the uptake of payment systems and identifies some policy issues for further examination.

With the development of the Internet in the 1990s there were high expectations for its widespread commercial use and for rapid growth in e-commerce. Early predictions were over-optimistic, and attention shifted to identifying various barriers to the widespread development of e-commerce. Specifically for business-to-consumer (B2C) transactions the development and use of online payment systems were identified as important concerns. Nonetheless B2C e-commerce is currently growing at around 25% per year and growth has been much higher in some segments (*e.g.* travel). International transactions have become more important, and much of the initially predicted growth has been attained if not surpassed. This report analyses the development of online payments systems from the viewpoint of their contribution to the development of online transactions, and identifies current issues and future challenges.

By far the major international online payment means are credit cards, which are also dominant in many national transaction markets. Some estimates put their use at over 90% of all e-commerce transactions. In some countries debit cards and payments via online banking are widely used alternatives to credit cards. There is also a large diversity of other payment means such as mediating services, mobile payment systems and electronic currency which may be appropriate for different transactions. However, with the exception of the mediating service PayPal, the majority of alternative online payment means have not yet gained the necessary wide user base of both merchants and consumers. For micropayments, which are of increasing importance for digital content industries, one-off payments are not yet widely developed as alternatives and complements to subscription payment models or cumulative systems.

The introduction of new payment systems faces significant barriers given infrastructure market characteristics, with high initial investment costs and positive network externalities favouring established incumbents with a wide user base. These characteristics strengthen the market position of traditional payment system providers - credit card institutions and banks - and associated lock-in to established and/or well-known systems and standards.

Earlier perceived transaction security problems using credit cards and online banking have been addressed by providers. Payment mechanisms such as MasterCard SecureCode and Verified by Visa have been developed and implemented and banking systems' security addressed. Other systems (notably mediating services and mobile telephony systems) have the potential to address specific markets, such as person-to-person transactions and micropayments. The development of mobile payments may also allow greater payment convenience. Micropayments are increasingly important with the rapid growth of digital content markets, although total transaction values are low in comparison with the volume of transactions. Cost-effective international payment systems for very small payments are still to be developed.

A set of emerging issues and barriers to the uptake of online payment systems is briefly listed, covering standards and co-ordination challenges, network and competition issues, and improving statistical information.

# INTRODUCTION

With the initial widespread uptake of the Internet, there were high expectations of its potential for commercial use and especially for e-commerce. As these predictions were too optimistic in the short run, commercial and policy focus turned to barriers to e-commerce development. Household surveys in OECD countries emphasised a range of barriers to business-to-consumer (B2C) transactions, among them consumer resistance to paying on line figured prominently. A number of issues around online payment systems were often used as one of several key factors to explain slower than predicted e-commerce growth. According to these arguments, the lack of appropriate online payment mechanisms, consumer confidence in electronic payments and/or issues with the perceived security of payment mechanisms partly explained the weak uptake of online shopping. In other words, payment-related difficulties were seen as one key explanation together with other factors such as products not being appropriate, sellers being unknown, delivery being uncertain, and consumers not being interested.

However there has been solid growth in B2C transactions (OECD, 2004a, 2004b), and many of the high expectations formed during the technology bubble are progressively coming true (The Economist, 2004a). An increasing range of products including various types of digital content is becoming available online, new platforms such as mobile devices are increasingly used for purchasing (OECD, 2004e), and whole new applications and markets are developing. However a number of questions still arise. Have online payment systems adjusted to challenges such as the trade-offs between costs versus convenience, ease of use and transaction security, and contributed to the growth of e-commerce? How are they adapting to the new forms of e-commerce? In 2002, consumer concern about safety of using payment cards was identified as key barrier to online purchases (OECD, 2002a). Is this still the case or is customer "terror of launching their financial details into cyberspace" (*The Economist*, 2000) still prevalent?

This report analyses the development of online payments and evidence on their use across OECD countries (see also Paunov and Vickery, 2004). It reviews characteristics of online payment means, and discusses the structure of this industry. The report identifies impediments to growth and emerging issues related to further developments and structure of online payments.

The main role of a payment system is to provide a way of transferring value between different parties in the economy. As such, it determines partly economic transaction costs. Its design will be optimal if organised to allow quick and effective value transfers while imposing a minimum of additional costs and risks. High costs of the payment process may seriously affect economic activity in that transactions are rendered too expensive and, as a consequence, reduced. Conversely, lower costs through efficient payment systems could have a positive impact on economic growth.

The use of any payment system involves direct and indirect costs. Direct costs are the fees charged by financial payment service providers. Indirect costs include those related to the complexity of transaction processes, speed of transactions, risk and uncertainty, and opportunity costs for the buyers and sellers involved. The modalities of the payment system also affect the cost structure as they determine the financial loss to both parties in case either one of them defaults on the terms of the contract.

For the reasons described above, online payment services involve a complex set of practical and analytical challenges. These include the technological capabilities of service providers, commercial relationships, issues of regulation and law (buyer and seller protection), security considerations including identification issues, such as authentication and verification, and co-ordination among a variety of parties with different and sometimes competing interests.

**Scope of the report**

The following questions will be addressed in this report:

- What online payment mechanisms exist?
- Which are commonly used online payment mechanisms? How do they differ across countries? Which payments systems are prevalent in national markets and for cross-border payments?
- What are the characteristics of different payment systems?
- What are the main features of the market for online payments? Who are the market participants? What are the consequences of network externalities and infrastructure costs?
- What are the drivers and impediments to development of efficient online payment systems?
- What are the emerging issues to be addressed on the industry supply and user demand sides?

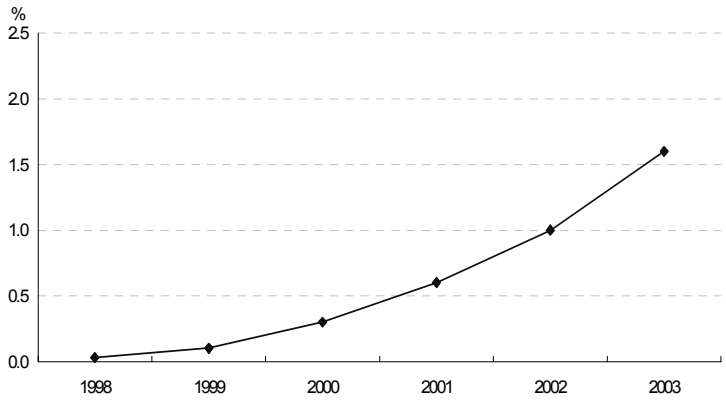
This report discusses various modes of online payment that are used to purchase items on the Internet. The main focus is on online payment means (such as credit card, debit card, online banking and e-money), and these are set in the context of traditional payment options as many on-line payment systems are extensions of off-line systems. Mobile payments, defined as payments using wireless devices such as mobile phones and personal digital assistants (PDAs), wireless tablets and mobile computers, are also examined. The report concentrates on business-to-consumer online payments rather than on business-to-business (B2B) financial transactions. With the success of online auctions person-to-person markets have gained in importance and are also considered. The various offline payment options available for buying on line are not dealt with.

**E-commerce development**

Recent developments in e-commerce provide the background to analysis in this report:

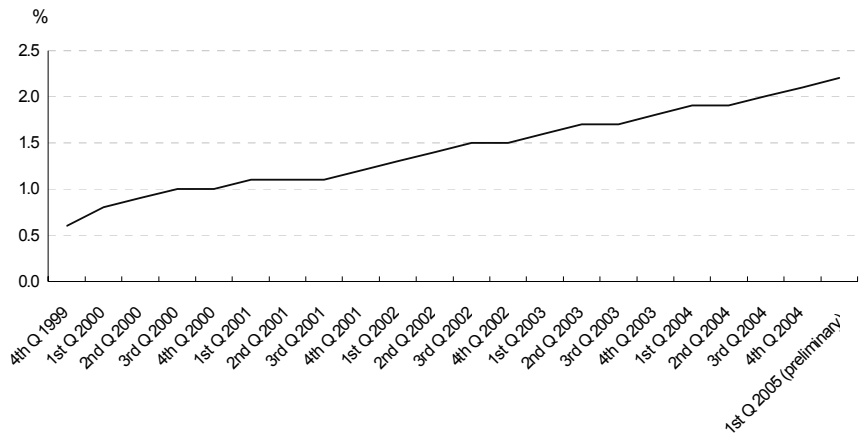
- Initially, the take-up of e-commerce was lower than expected.
- However, e-commerce transactions and the supply of digital services and content have continued to grow relatively rapidly (OECD, 2004a, *The Daily*, 2004, US Department of Commerce[1]).
- According to the type of e-commerce, B2C has a lower total value than B2B.
- Online selling is not yet a major distribution channel; in most industries B2C e-commerce represents a small fraction of total retail sales (around 2-3% in many countries), but online sales have grown consistently. For example, in Japan and the United States the share of B2C e-commerce in total sales has constantly risen over the last five years (Figures 1 and 2). Further, in some industries, *e.g.* travel, a large part of all purchases is on line.

**Figure 1. Business-to-consumer electronic commerce in Japan**
**Percentage of total B2C sales**




*Source:* OECD STI Scoreboard 2005.

**Figure 2. US e-commerce retail sales**
**Percentage of total retail sales**




*Source:* OECD STI Scoreboard 2005.

- Larger firms are more frequently involved in online sales (whether B2B or B2C) than smaller ones. (Table 1, Figure 3, OECD, 2004a).
- The use of broadband has had positive impacts on the volume and structure of online shopping and information search (OECD, 2004a).
- As experience with selling online grows, understanding of online consumer spending patterns and barriers are increasing.[2]

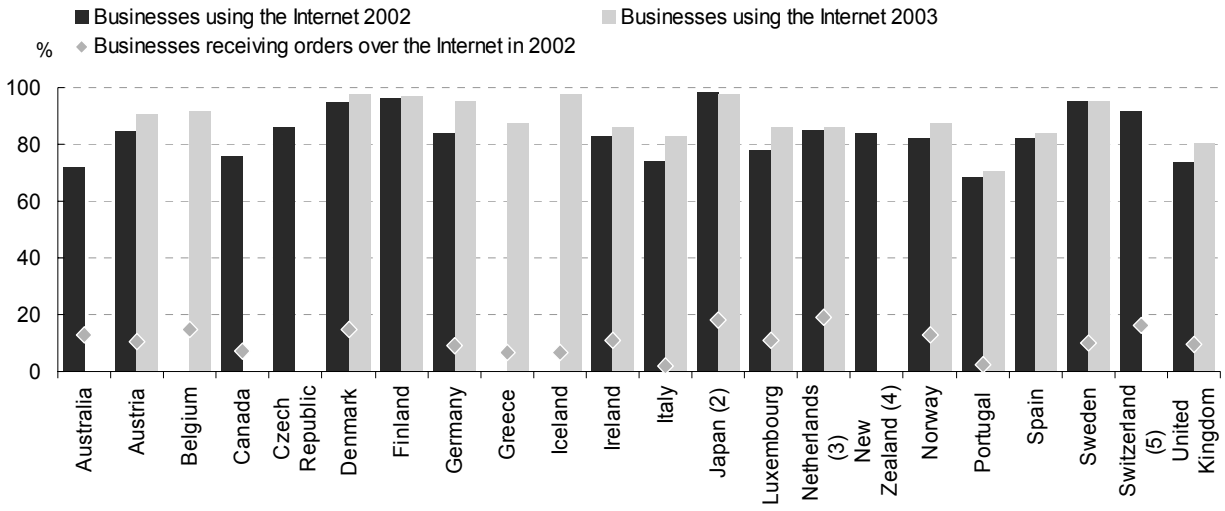
**Table 1. Online buying and selling by size of firm in Canada 2002**
**percent**

| Size of firm | Online purchases | Online selling |
|---|---|---|
| Small | 29 | 7 |
| Medium | 47 | 13 |
| Large | 57 | 16 |
| Total | 31.7 | 7.5 |

*Source*: Statistics Canada.

**Figure 3. Businesses using the Internet and businesses receiving orders over the Internet**

Percentage of businesses with ten or more employees, 2003 or latest available year (1)



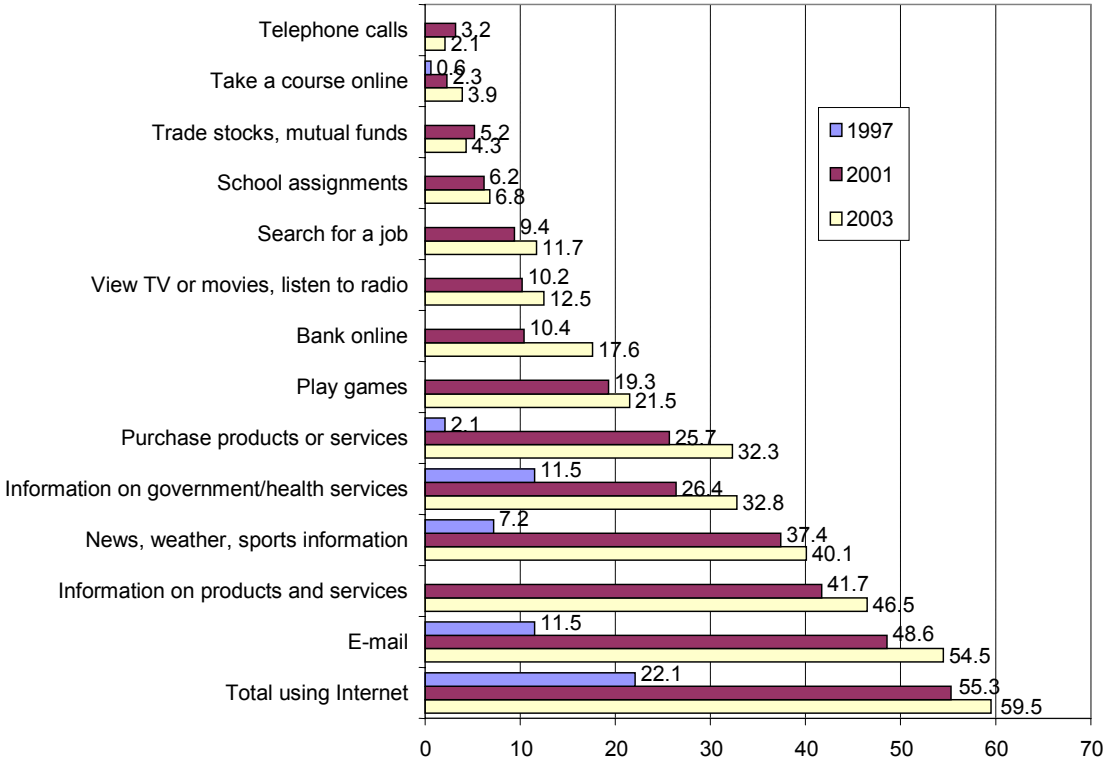

1. In European countries, enterprises with 10 or more employees in the business sector, excluding NACE activity E (electricity, gas and water supply), NACE activity F (construction) and NACE activity J (financial intermediation). Eurostat Community Survey on enterprise use of ICT, at least 1% threshold for the enterprises having received orders via Internet.
2. Data refer to enterprises with 100 or more employees. Agriculture, forestry, fisheries and mining are excluded.
3. Use, orders received and placed refer to Internet and other computer-mediated networks.
4. Data refer to 2001 and include enterprises with more than ten employees in all industries except electricity, gas and water; government administration and defence; and personal and other services.
5. Data refer to industry, construction and services. 2003 estimates. Businesses receiving orders over Internet refer to 2001.

*Source*: OECD, ICT database and Eurostat, Community Survey on ICT usage in enterprises 2002 and 2003, October 2004.

### *Items purchased*

The Internet has been most frequently used for e-mail exchange and as a source of information (OECD, 2004b). For example over half of all adults in the United States used e-mail in 2003 and 40% searched the Net for news, weather or sports information (Figure 4). About one in three US adults bought services or goods on line, and nearly half used the Internet to gather information on products and services, while over one in five adults played games on the Internet, and some 12.5% listened to music or watched movies, and online banking had shown rapid growth. The data also show that for all purposes the Internet has become more important since 1996 (U.S. Census Bureau, 2005).

**Figure 4. Share of population aged 18 or older using the Internet for a specific task: 1997, 2001 and 2003**



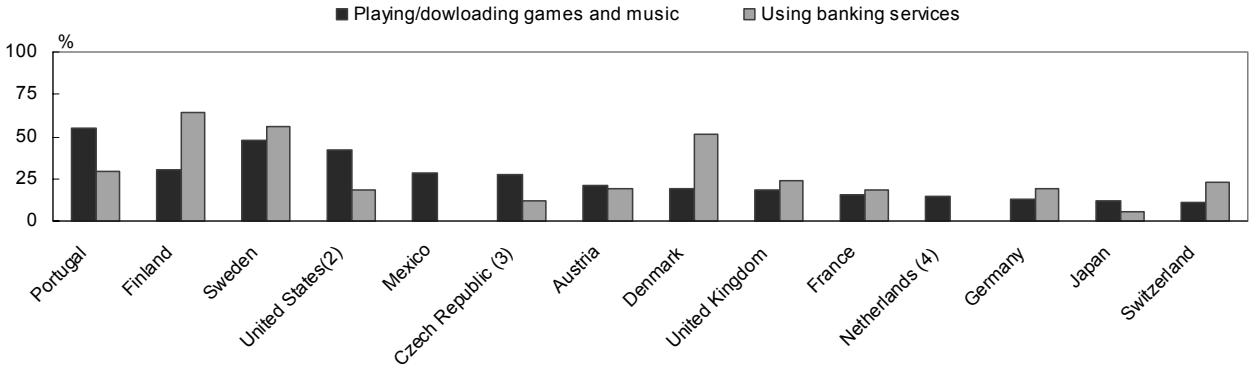

*Note*: Information on government/health services data from 1997 derive from the answer: "search for information such as government, business, health and education."
Purchase products and services data from 1997 derive from the answer "Shopping"
*Source*: U.S. Census Bureau, Current Population Survey, October 1997, September 2001, October 2003.

Travel is the most important category in B2C e-commerce and it represents about one-third of online consumer spending For example, according to comScore online travel spending by Canadian residents represented 46% of total consumer e-commerce sales excluding auctions by the end of 2003 (OECD, 2005a; OECD, 2004b). Information in the form of reading materials such as books, magazines and newspapers are also important among purchased e-commerce items. This category constituted 27% of e-commerce purchased items in Canada (Statistics Canada, 2003). Furthermore, the increasing uptake of banking services in Nordic countries is noteworthy.

Products whose characteristics render them especially suitable for e-commerce are those that can be digitally delivered. Physical products, by contrast, require physical delivery (and potentially face-to-face purchase), which adds another challenge to e-commerce. Examples of digital products are newspaper articles, and digital content such as software, games, and music, as well as services such as banking, travel and tourism which can be digitally delivered.[3] Figures 4 and 5 illustrate the growing importance of downloading games and music across OECD countries.

The importance of digital content in e-commerce is likely to grow further with the increasing development of content for mobile platforms. This trend may be further enhanced by increased co-operation between mobile operators and content providers, as for example in the music industry (OECD, 2004e). The growing prominence of this type of product raises specific issues for online payments, most importantly suitable micropayment options for low value access and downloads.

**Figure 5. Internet use by type of activity, 2002 or latest available year[1]**
**Percentage of individuals using the Internet**




1. 2001 for France, Mexico, Netherlands, Portugal, Switzerland and the United States. Beginning of 2002 for Austria, Denmark, Finland, Germany, Sweden, the United Kingdom, and 2002 for Japan.
2. Playing games only instead of downloading games and music.
3. Banking services relate to year 2003 (Czech Statistical Office Survey).
4. Downloading music only instead of games and music.

*Source*: OECD, ICT database and Eurostat, Community survey on ICT usage in households 2002, June 2003, *OECD Information Technology Outlook* 2004, Chapter 3.

## ONLINE PAYMENT SYSTEMS

A wide variety of payment mechanisms as well as related services is currently available. This section provides a summary of the uptake of online payments, and is followed by a brief account of common payment systems.[4]

### The uptake of online payments

The use of online payments varies widely across countries. The Nordic countries (*e.g.* Sweden[5], Finland[6]) are notable users of online payments; and in Australia and New Zealand there has been an important trend towards adopting online payments (BIS, 2004). In contrast, there are markets where online payments have struggled to capture market share; for example in Japan online payments are still low despite important e-commerce growth.[7] Also in Germany offline payment methods such as cash on delivery have been frequently used for online purchase.

In the absence of official statistics on the use of different kinds of Internet payment instruments, data provided by payment service providers such as the European group Pago, provide useful estimates. In 2003, 94% of the total number of worldwide e-commerce transactions carried out via Pago used credit cards (Pago, 2003). Evidence from other sources confirms this dominance: For instance, Visa European online sales for 2003 were EUR 12.6 billion doubling 2002 results (Visa, 2004b). VisaNet shows increasing use of credit cards particularly for airlines, catalogue ordering and travel (Visa, 2004c). However, for 2004 Pago data found credit card dominance decreased somewhat to 81%. Much of this drop in share was due to a significant increase in the use of electronic direct debit especially by German consumers who have been increasing online purchases and payments, and their direct debit payments rose from 6.5% to 17% in 2004 (Pago, 2005). The emergence of credit cards as the major payment system has been relatively rapid considering that in 1999 the market was still dominated by traditional financial intermediaries which offered conventional electronic payment services. However, national habits and specific industry characteristics matter for the use of online payment systems and there are significant differences in payment markets by country and payment types. For example, in Germany and some Northern European countries the share of credit cards in online payments is significantly lower, and in markets such as online auctions credit cards have a smaller market share.

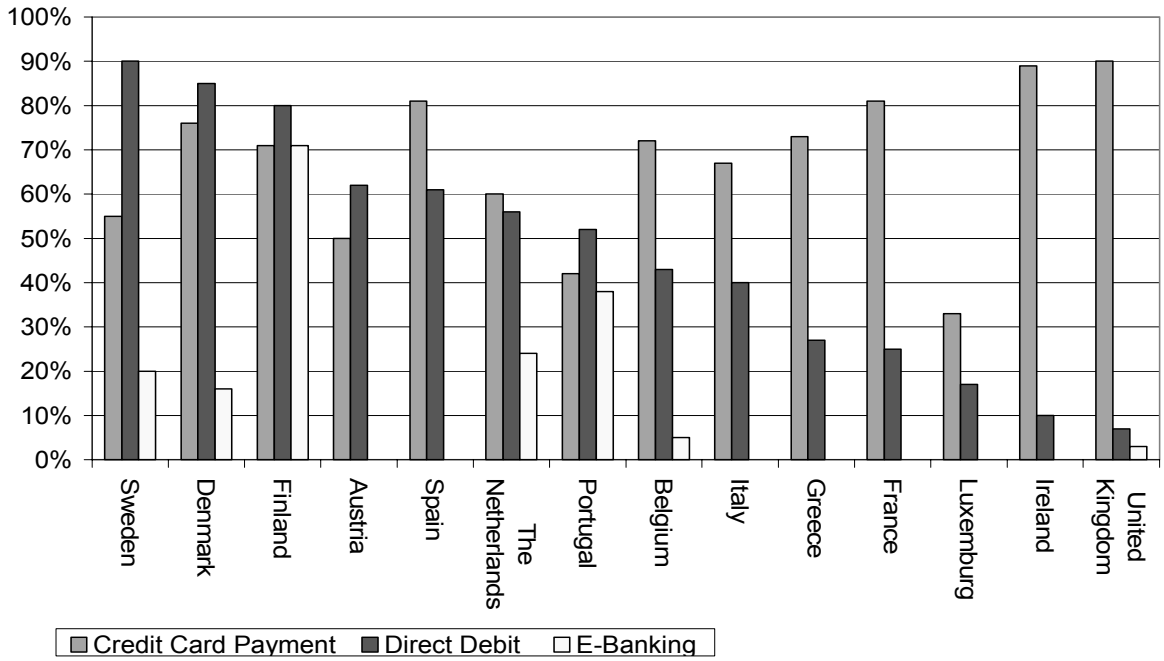
Mobile payment methods are increasing in number, and in 2002 a third of the new payment schemes recorded by the Electronic Payment Systems Observatory (ePSO), used the mobile platform (Carat, 2002). In some countries, as for example Japan, mobile phones are used more frequently for payment than PCs and they are also used in some other countries including Finland and Korea although other payment methods are preferred (OECD, 2004e). But not all mobile payment systems have been successful and there have been challenges to establish independent mobile phone payment systems.[8]

### Uptake in selected countries and regions

***European Union***. Across the European Union, the most commonly accepted online payment instruments are credit cards, direct debit cards and e-banking. A 2003 study of European Web sites found that 78% of Web sites in the sample studied accept classic credit cards, 51% direct debit and 9% e-banking (Figure 6, PwC, 2003).[9] Some evidence suggests that in Europe as a whole the share of credit cards in online payments is lower compared to non-European countries and direct debit and online banking higher

(Pago, 2005). However, there were significant differences across countries. Credit cards and direct debit payments were the primary options in all countries but e-banking was a fairly common option in some countries (Finland, the Netherlands and Portugal) and is being increasingly offered, notably in Northern Europe and higher income countries where banks have co-ordinated their online payment systems. Mobile payments or electronic cheques were less frequently provided. Instruments such as debit cards have grown, with a surge in offerings from 2001 (BIS, 2004).

**Figure 6. Payment methods most frequently proposed by e-commerce Web sites**




*Source*: PwC, 2003.

***Finland***. In Finland credit and debit cards and online banking payments are important for financial transactions on the Internet. Online payments have a favourable environment and approximately 91% of payment transactions are electronic (Finnish Bankers Association). However more innovative payment means are not frequently used for online payments. The results of a 2003 survey suggested that less than 7% of mobile phone users have used their phone for ordering or purchasing online (Statistics Finland, 2003).

***Germany***. Online debit and online transfer were most frequently used for Internet purchases by respondents of a recent online survey (Table 2).[10] Credit cards were also important but less frequently used (Krueger, 2004). According to data from payment provider Pago, in 2005 only 29% of German online transactions were made using credit cards. The statistics also confirm the importance of direct debit; nearly 64% of all payments used this method (Pago, 2005). For purchases of digital content only, the results are similar; and mobile phones were not used frequently for any type of purchase - including for digital content.

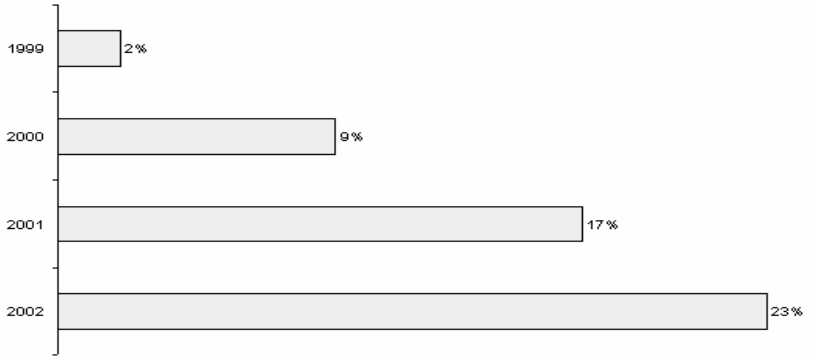
**Table 2. Survey Result: Payment methods used when shopping on line, Germany**

| Payment method | % of respondents (multiple answers possible) |
|---|---|
| Mobile phone | 3.3 |
| Prepaid systems | 22.6 |
| Billing systems | 54.9 |
| Credit card | 62.4 |
| E-mail | 14.4 |
| Online-debit | 70.3 |
| Online-(giro)-transfer | 79.0 |
| Paper-based debt | 40.6 |
| Paper-based (giro)-transfer | 53.3 |
| Cash on delivery | 63.9 |

*Source*: Krueger, 2004.

***Australia***. According to the Australian Bureau of Statistics in 2002, 23% of all adults used the Internet to pay bills or transfer funds. There has been a continuing positive trend in online payments usage, with a tenfold increase from 1999 to 2002 in Australian users of the Internet for payments, and this trend has continued. Although these are not necessarily payments for e-commerce transactions, the high levels of use suggest familiarity with online payment systems for e-commerce.

**Figure 7. Australian households paying bills or transferring funds via the Internet**




*Source*: OECD, based on Household Use of Information Technology, ABS, 2003.

***Korea***. Online banking is commonly used in Korea and has grown very rapidly (Table 3). If familiarity with online banking is used as a proxy for possible uses of online payments for e-commerce, then this suggests that online payments are likely to grow. Household surveys show that 25% claimed to use e-commerce transactions in 2002 - an increase from 15% in 2001, with credit cards taking an increasing share of transactions (67% in 2002 compared with 54% in 2001) and wire transfers decreasing proportionately (Korean Statistical Office).

**Table 3. Online banking users in Korea**
**thousands**

| | 1999 | 2000 | 2001 | 2002 | 2003 |
|---|---|---|---|---|---|
| Online banking user | 1 230 | 4 090 | 11 310 | 17 710 | 22 754 |

*Source*: The Bank of Korea.

***United States.*** Credit card payments are the most common payment option for online purchases in the United States. Among new payment systems, the mediating service PayPal has been very successful for person-to-person payments and moderately successful for some other payments. According to PayPal, one in three online buyers has an account with them, and by the fourth quarter of 2004, PayPal had 45.6 million accounts, an increase of 67% over 2003, with revenues and profits growing rapidly.

## Characteristics of online payment systems*

A wide range of systems has been developed for online payments. The analysis of online payment systems in this report follows the scheme in Figure 8. It is divided into account-based and electronic currency systems. Account-based systems allow payment via an existing personalised account (usually a bank account), whereas electronic currency systems allow payment simply if the payer has an appropriate amount of electronic currency. Five different forms of account-based systems are described: *i)* credit cards, *ii)* debit cards, *iii)* mediating systems, *iv)* mobile payment and telephony account systems, and *v)* payments via online banking. Electronic currency systems can be divided into *i)* smart card and *ii)* online cash systems. As the focus of this work is upon recent trends in online payments, the scope of this overview does not cover offline payment mechanisms such as cash on delivery. Also, certain aspects including aggregation are not covered in detail.

This section gives an overview of the characteristics of different online payment systems, briefly describing their features and initial comparisons among the systems. The discussion covers selected characteristics summarised in Box 1 focusing on applicability, ease to obtain, ease of use, and cost. Table 5 provides a summary of these characteristics for different payment systems.

**Box 1. Selected characteristics of online payment systems**

**Applicability.** Availability (point of sale coverage), payment size (*e.g.* micropayments, large sums) and destination (*e.g.* merchants, private persons).

**Ease to obtain.** Ease / complexity of registration.

**Reliability/ease of use.** Simplicity, ease and transparency of use by customers and merchants.

**Cost.** Distribution of costs between merchants and users; cost structure (*e.g.* fixed transaction charge or proportion of sales value).

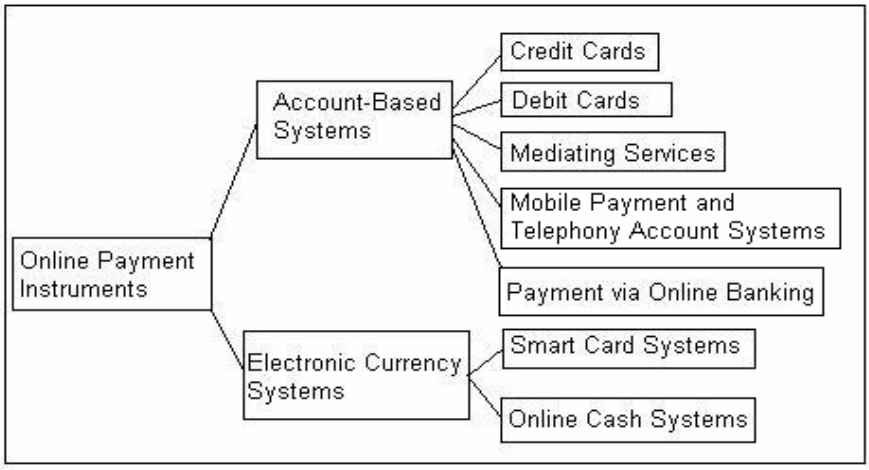
**Security. C**ustomer confidence and economic sustainability, information transmission mechanisms from buyer to seller, security of information stored on client and seller equipment.

**Liability.** Legislative protection and provisions, coverage of potential losses.

**Anonymity.** Protection of personal information; tradeoffs between anonymity and traceability for payment support.

* There has been a great deal of innovation and turbulence in the provision of online payment systems and many of the early examples mentioned in the following text are no longer operational or have changed their operating strategies.

**Figure 8. Classification of online payment systems**




*Source*: OECD.

## Account-based systems

### *Credit cards*

Credit cards are widely used to pay on line. Initially there was relatively little adaptation of credit cards to online payments apart from additional security codes. But new, more secure features have been added to protect transactions. A major difference between online and offline payments is that in online purchases a physical copy of the card is not provided and the merchant does not obtain a signed, or similar, confirmation from the customer. Also, whereas all offline transactions are authorised this is not the case for all online purchases (especially with small businesses,) although authentication and verification technologies have increased the ability of accurately authorising transactions.

*Characteristics*

*Applicability.* The credit card system has a long-established network of users and merchants ensuring widespread applicability and a large user base for transactions of most kinds. However, fees for credit card operations for small payments are relatively high; a fact that makes credit cards a less-suitable payment system for micropayments. A potential way of adapting credit cards to micropayments is by using cumulative or aggregation payment solutions (see discussion on micropayments). Another limitation arises for person-to-person payments as a seller needs a merchant account with the credit card company to accept payment and this option may not be feasible for occasional transactions or small businesses.

*Ease to obtain.* One of the main advantages of using credit cards for online payment is that the customer does not need to obtain any additional hardware or software and there is no need for further registration with third parties. However, some segments of potential buyers may not be eligible for this payment method. For example, in the rapidly growing online games market, one third of game players are less than 18 years old. They may not have a credit card because minimum financial conditions have to be fulfilled (OECD, 2004d).[11] More importantly, in some emerging economies where credit cards are not widespread, the system may not be most suitable for online payments.

*Reliability/ease of use.* Payment systems are relatively easy to use provided users have experience with online transactions. The frequency of uncompleted transactions may serve as an indicator of ease of use. Some illustrative evidence comes from the Pago Platform that processed around 90 million

transactions in 2004. In their 2003 analysis of a large sample of their 2002 transactions one in three credit card transactions (32.5%) did not end in payment, and a main cause was the rejection of credit card information by the authorisation system (56% of failures). Possible reasons for a large share of these non-completions include mistakes in entering information, credit card number not existing, verification number incorrect, an un-issued number, unfamiliarity with verification numbers, and insufficient account funds, as well as a relatively small share of rejections due to possible fraud (9%). German online purchasers had a much lower rate of unsuccessful transactions (12.6%), but the distribution of reasons for non-completion is similar to the overall sample. These results are based on analysis of 3.67 million transactions that include representative online sellers from 29 different countries and buyers from 198 countries (Pago, 2003).[12] There were no major changes in 2003; analysis of 16.5 million transactions showed that 34.5% of worldwide credit card transactions did not end in payment (Pago, 2004).

*Cost.* The fee charged by the credit card company to the merchant ranges from 2-6% depending on geographical location, issuing bank, merchant category and sales characteristics (including size, the importance of national and international sales) (Pago, 2003), and there is usually a certain fixed fee for opening and maintaining a credit card account. Further, as non-completion of credit card payments appears to be relatively high, there may be additional costs (perhaps up to one third higher) for online stores. Even when the credit card transaction is authorised and concluded, the merchant may have to cover costs for payment reversals. Merchants generally bear the cost of "chargeback" if they do not have a customer transaction signature and these costs could prove onerous for smaller merchants.

*Security and related issues*

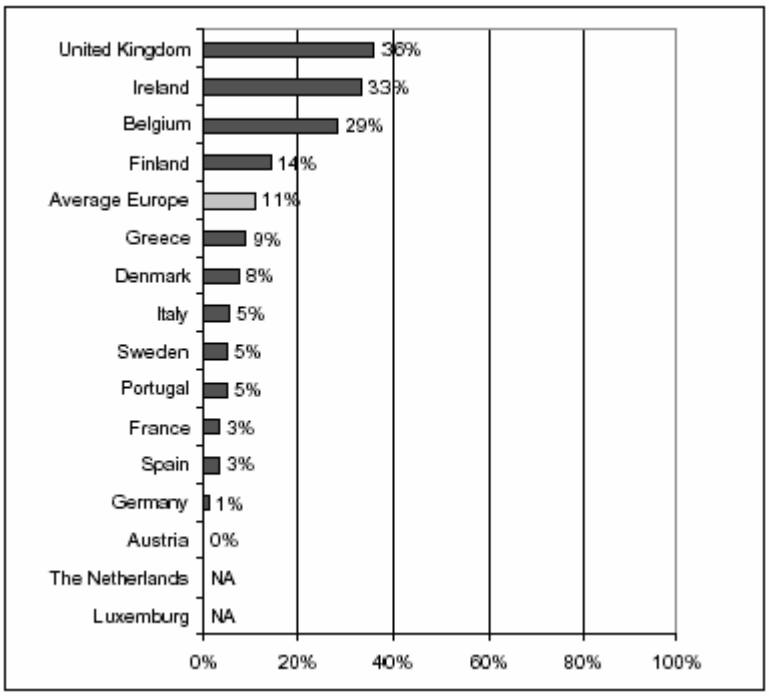
Since credit cards were not specifically designed as online payment systems, there are inherent risks associated with their use as such. Cardholder authentication has usually been handled through the provision of name, credit card number and expiration dates without further authentication.[13] In giving this information the online customer provides the merchant with information that could be used by others for online purchase if intercepted. Hence this information needs to be secured during transmission and on the receiving server. Moreover, an important share of online sellers store credit card information (Figure 9 gives a picture of the minimum share that store information for some time). To the extent that they keep financial data on their servers, additional requirements for secure Web site information storage arise to prevent misuse of financial information.

To prevent information interception during the transmission of credit card information, secure socket layer (SSL) service, which is widely used for a variety of security applications, is commonly used. SSL also allows verification of merchant identity via the SSL server certificate (see description of SSL below). Despite the availability of tools to verify and secure online transactions, a significant share of e-commerce sites (10%) may still lack protection mechanisms for the transmission of information (PwC, 2003), and some industries have significantly lower levels of implementation. Although these are general problems that apply also to other payments, they will largely affect credit card payments because of their very high use for online transactions.

*Enhancing security.* Credit card companies have taken numerous steps to address security concerns, and a number of complementary systems have been developed. Some such as SET[14] have not had a wide take-up, and currently the most important systems are one-off credit card numbers, MasterCard SecureCode and "Verified by Visa". The latter two protect an existing credit card with a password created by the user, assuring the user that only they can use their credit card when shopping online. The idea is to progressively have these more secure payments substitute simple credit card payments. An important step in this direction has been taken with the industry adoption of this payment technology as a standard. One-off numbers provide increased security, as any interception of information is rendered useless by once-only use. Although there may be extra costs, there are no significant network limitations as the credit card

network is used. An application is the ABN-AMRO e-wallet, which generates one-time credit card numbers. This is a special and not a general characteristic for e-wallets, which are encrypted storage mediums holding financial information; they make payment easier as data do not have to be re-entered (see PwC, 2003).

**Figure 9. E-commerce Web sites storing customer credit card numbers in Europe**
**percent**




*Source*: PwC, 2003.

Verified by Visa is a system that connects the card owner for each transaction directly with the bank by using a personal password and a personal message verifies the bank connection. This double authentication increases payment security. Inscription for customers at their bank is relatively easy. Another important characteristic of the system is its payment guarantee: The higher frequency of payment cancellation in online payments often represents a significant cost to merchants.[15] With Verified by Visa the entire cost is borne by the credit card company, addressing merchant concerns over accepting credit cards. But at the same time, limitations for charge-backs mean that consumers face less favourable conditions under this system in comparison to simple credit card payments and lower costs for merchants is balanced against less flexibility for customers.

The programme has experienced a successful initial merchant uptake across all regions, although uptake on the consumer side has been weaker. In Canada all banks support Verified by Visa, and in Korea the programme has received official supported by the government, which selected it as a secure payment option. By 2004, more than 10 000 Internet sellers in Europe had subscribed to the system. Well-known businesses using the Verified by Visa system include flight operator British Airways, the major German mail-order house Otto, British food supplier Tesco, Spanish newspapers *El Pais* and *La Vanguardia*, and the European flight operator RyanAir. In Australia, South-East Asia and North America some important online sellers have subscribed to the service, and in the United States these included Walmart, Sony's Playstation and flight operator Northwest Airlines, although major online sellers such as Amazon had not.

Other developed mechanisms are 3D Secure/Verified by Visa and MasterCard SecureCode/UCAF. MasterCard's SecureCode provides a similar service to add protection against unauthorised online use of credit cards. Once the user has registered and created a private SecureCode, they are automatically prompted by the financial institution to provide the personal SecureCode in order to purchase online. The merchant will not receive information concerning the code. So far a significant number of banks and other merchants offer the service in the United States, United Kingdom and other countries, including British Airways, Continental Airlines and Reebok.

*Liability.* The range of payment systems falling under legislative protection differs widely across countries. In Denmark, for example, legislation covers all payment cards; in comparison, in the United States the most important protection is for credit cards, as risk is carried by card providers (OECD, 2002a). Hence, in some countries consumers wishing to use alternative payment means to avoid transferring credit card information over the Internet may give up considerable credit card-related consumer protection guarantees by using these means. According to various industry specialists, the chargeback option is one of the key advantages of credit cards over other payment systems, and alternative payments often do not provide it. On the other hand, many of the alternative payments are offered by third parties, who may provide strong protection of consumer information, and are becoming more competitive in their chargeback strategies for both consumers and merchants.

*Anonymity.* Generally, using a credit card means paying via an identifiable account and thus losing anonymity. However, credit card payment schemes exist where the client receives "virtual" credit card account numbers, which are specific to individual transactions. In this payment process, the identity of the buyer is hidden from the seller and only the buyer's bank retains a record of the buyer. As the buyer's customary credit card number is not given to the merchant this provides an additional level of security. Citibank US offers this service free to its customers and additionally offers USD 0 liabilities on unauthorised charges for consumers if they pay via this service.[16]

***Debit cards***

Debit card payments are directly withdrawn from the bank account and not from an intermediary account in contrast to credit cards. This can make it difficult for consumers to handle a dispute/charge-back, since there is typically no extra protection of the funds in a debit account. Once the funds have been withdrawn, they are harder to refund than with a credit card. Also, for debit payments a physical card and/or providing a card number is often not necessary; an account number may be enough. Apart from these differences, the payment mechanism is comparable with credit card transactions.

*Characteristics*

Debit cards have a significant user spread, which in most countries is higher than the number of credit card users depending on financial regulation and conditions attached to credit card issuance. However, debit card payment is generally not as widespread on merchant Web sites as credit card payment, their application is mostly limited to national payments, due to the national structures, operations and regulation of banking systems, and they do not address the demand for international payments. Furthermore their cost structure (as for credit cards) is not most suitable for realising one-off micropayments. It is again essential to provide SSL for the transaction as well as for merchants and consumers to take the necessary security precautions (see details above). Banks frequently impose stronger identification requirements for debit payments and their overall security has been found to be higher than for ordinary credit card payments (see *e.g.* PwC, 2003).

Debit card holders are less well protected in terms of legislation than credit card holders (OECD, 2002a). For example, there is a lack of specific protection in case of un-delivered goods or services,

notably in the United States, Austria, Canada, Greece and the United Kingdom. Furthermore, as this is an account-based payment card, it does not usually allow for anonymous payments.

***Mediating services***

These mechanisms employ traditional payment means and add a further layer to it. To be able to use the service, it is necessary to register providing credit card or bank account details as the source of payments. A very successful mediating service for online transactions, beginning in the United States, is the PayPal payment option. To pay, buyers only need to know the seller's e-mail address, which is verified and linked to a PayPal account. The payment will be debited from the buyer's personal PayPal account. No further financial information is transmitted to the seller. Another mediating service is the German FIRSTGATE Click&Buy. By 2005, more than 3 500 industry content providers of media, publishing, research, music, and online games with more than 5 million customers used the payment system. Further, the payment system has become increasingly internationalised, notably with the development of the Click & Buy Alliance that connects major telecommunications providers, ISPs and financial institutions.[17] Click&Buy has been licensed by British Telecom in the United Kingdom and Ireland, and by SWISSCOM in Switzerland and TelMex in Mexico. In March 2003 FIRSTGATE Click&Buy was introduced to the US market. Other important mediating payments options are offered by mobile service providers (see below).

There are differences in pricing structure, in whether or not both parties have to sign up for the service and other such characteristics across providers. Some systems allow paying from the personal bank account and are bank-related offerings (*e.g.* Italian Bankpass Web[18] or Japanese Inter Debit and Net Debit[19]), whereas others may require pre-funding an account with the service provider. For example, the United Kingdom has several online account-based e-payment services, used for person-to-person payments and sometimes by businesses to offer customers a means to pay online. Examples are Moneybookers, NatWest FastPay, NOCHEX, PayHound and Yahoo! PayPal launched UK service in early 2004.

*Characteristics*

*Applicability.* Mediating services provide satisfactory payment methods for purposes such as online auctions; they allow person-to-person transfers without the seller having to register as a merchant (as required for accepting credit card payments). As mediating services rely on established payment networks, they benefit from an already existing network. The payment function can also increasingly be used in other areas, *e.g.* for some dotcoms, to pay taxes in certain countries, to provide gift vouchers, online music sales, etc.[20] In the example of PayPal both seller and buyer require an account with the service, and the size of the user network is important. Only a few mediating services seem to have overcome this obstacle, for many providers it persists; even PayPal faces a restricted network outside auction-related (*i.e.* eBay) payments and outside of the United States.

*Ease to obtain.* Consumers have to sign up for the service, but charging the account does not involve major efforts as existing credit cards can be used. However, it means establishing an extra relation with an additional provider and can be used only after registration for online purchase. But a key advantage for sellers is that they can obtain an account easily and do not need to create a merchant account. This is the essential feature of the PayPal payment option that explains much of its success. It renders the service particularly attractive to small and medium sellers; the payment system is thus capturing a niche market rather than providing a general payment option.

*Cost.* The PayPal system is free of charge for buyers and earns revenue from charging merchants. It charges a rate of 2.2-2.9% and a flat fee of USD 0.30 per transaction. To make its cost structure more attractive for micropayments in the digital music sector, the company charges a rate of 2.5% plus

USD 0.09 per transaction (Navraine, 2003). However, the fixed component in the payment structure is a major cost disadvantage for competition in the micropayments sector.

*Security.* Centralised account systems can, in principle, support only limited technical security above that of the established payment networks on which they are based, because their advantage over other payment instruments (easy registration procedures) may be lost if stronger security measures (strong authentication) were implemented on top of the established payment networks. In order to enhance security and be able to deal with "phishing", identity theft and other criminal activity, providers have planned two-factor authentication at the domain level, *i.e.* authentication methods that include a hardware token. It depends on the exact features whether this will render the payment process more complicated.

The main security features of the system are the following: In contrast to debit and credit card payment, financial information stays with the service provider and is not transmitted to every seller. Because both buyers and sellers have frequent transactions with PayPal rather than with individual merchants or buyers there are incentives on both sides not to defraud, to ensure future benefits of making/accepting payments through the service. This, however, supposes in particular that sellers cannot create multiple identities.[21]

*Anonymity*. As the buyer has to register with the service there is no inherent anonymity in the service. The provider may be storing and using the information provided, for example if there are close relations between the mediating service and a merchant site.

***Mobile payment and telephony account systems***

Mobile payments are payments conducted through wireless devices. They may be used to conduct payments for example via a bank account or via the telephone bill.

*Mobile banking*. GSM/SMS systems are used for contacting and effecting payments with the bank (m-banking) as alternatives to PC-based systems. A further method is to make use of WAP for e-banking applications. In the Postbank-O2 mobile banking payment Postbank customers are provided with WAP telephones based on pre-paid subscription to access an m-banking application.

*Bank-based mobile mediation services.* An example of a mass-market mobile phone payment method is Paybox using GSM phones.[22] Internet transactions and payments to other GSM phones are possible. The client enters the mobile number together with the amount to be paid and confirmation takes place with a personal Paybox PIN. An automatic reply from Paybox acknowledges the payment. The amount is debited from the customer's bank account.

*Telephony for payment.* There are two different ways in which telephony accounts are used for payment: *i)* "premium rate" models and *ii)* "direct transfer" models. In the "premium rate" model the customer pays a higher rate for the service, which is then passed on to the merchant by the telephony operator. Payment occurs by phoning a special number the merchant has installed with an operator, by sending a particular code by SMS, by voice contact, or by dialup to access content on a site and the user is charged by the minute for using the site. The direct transfer models consist in charging the telephony account directly for payment. This is often done by installation of specific software by the operator that offers the payment option. It can be used to debit the consumer's account to pay another account (see PwC, 2003).

*Characteristics*

*Applicability*: *mobile payments*. These systems may be widely applicable due to the very impressive growth and high penetration of wireless access compared to other telecommunication infrastructure

(OECD, 2004a). Mobile device systems are being developed for small offline payments (transport tickets, parking fees) as well as for online e-commerce purchases. Mobile payments are potentially attractive for e-commerce merchants because of the large mobile phone user base and installed billing and payment systems. An example of a mobile payment means is Paybox in Austria, which provides a variety of services ranging from secure Internet shopping, to paying for hotels, to purchasing parking tickets. Mobile payments are also becoming increasingly common for buying mobile content. Additionally, young people, who are important purchasers of digital content (*e.g.* ringtones and games), may not have a credit card. So paying via the mobile phone bill or prepaid cards may be their only available payment option (OECD, 2004e). However, mobile payment systems have encountered difficulties gaining a sufficient user mass for a variety of reasons. Paybox, for example, now only operates in Austria, and has discontinued attempts to operate in other countries.

International mobile payments remain a challenge, and it is currently uncertain whether such payment options will be available in the near future. Simpay, a payment service association set up by Orange, Telefónica Moviles, T-Mobile and Vodafone in 2003, was an attempt to create a unified European m-payment system for micropayments and international payments (OECD, 2004e). However, the venture failed as intense competitive rivalry among founding companies resulted in disagreements on the scope and applicability of a common system and members started to develop individual systems. As a result, a possible future outcome may be separate, more complicated and costly m-payment options. Alternatively, other payment options may substitute this option altogether (EurActiv, 2005).

*Applicability: telephony systems*: To take one example, the T-Pay system of Deutsche Telekom provides different payment possibilities for consumers: Internet payments can be undertaken by charging the phone bill or by phoning a special number; additionally it is possible to pay by credit card or debit card and with MicroMoney, an electronic money card that allows anonymous payments. With this business approach the telephony account system widens potential applicability provided that it receives wide merchant adoption.

*Ease to obtain.* The ease of obtaining mobile payment systems differs. Ringtones or online games can often be downloaded and paid for via premium SMS or premium call. However consumers may not know how to use mobile phones for online payments, and easy processes and detailed explanations may be important for widespread adoption. For specialised payment services that are separate from the mobile operator (*e.g.* Paybox), prior registration is necessary.

*Cost.* Costs differ across telecommunication service providers and systems. Mobile payment options are still emerging so current cost structures are not good indicators of actual prices especially as scale economies are likely with further developments.

*Security.* Security characteristics differ across services. As a general aspect for mobile phones, they offer additional possibilities for customer authentication, specifically SIM and PIN. For specialised payment services, security is assured via multiple measures; a personal PIN, the phone number and the mobile phone (*i.e.* the SIM card) itself – are all necessary for payment. Furthermore, the connection between the handset and the base transceiver station (BTS) is encrypted.

*Anonymity.* Payment takes place either via the telephony or another account. Storing and tracing consumer information and spending is thus possible. Mobile phones with pre-paid accounts may offer greater anonymity. However, in many countries users are required to register to use pre-paid accounts.

***Payment via online banking***

Use of e-banking for online payments is not widespread across OECD countries. However, for three EU countries (Finland, Portugal and the Netherlands) online banking payment appears to be important according to their Web site availability (see Figure 6) and it appears to be growing in availability and use in Northern Europe particularly. A number of Electronic Bill Presentment and Payment (EBPP) systems are available; examples are Nordea Solo (Finland) and Telecast (France). However, apart from adoption in Nordic countries, in most countries they are only marginally used. E-banking enjoys widespread use in the United States, in particular among early adopters of the Internet and online services.

A number of online payment systems have been developed in Europe, especially where offline bank transfers are already well established. The most common and easy to use include: online banking transfers where the account holder is redirected to the bank's Web site by the merchant site to effect payment. Other options are: *i)* electronic and mobile banking which have more advanced features, for example, schedule payments and *ii)* EBPP, where instead of having to enter all transaction details manually, these are automatically entered from the electronic bill and the payer only authorises. The EBPP provider (either bank or third party) establishes contracts with the organisations whose bills it can present electronically (*e.g.* utility companies) and will send in the bills the buyer has authorised.

*Characteristics*

*Applicability.* Online banking has grown rapidly in some countries as payment systems are in place and familiarity is very high so that there is potential for further applications and merchant use. However not all countries have frequently provided online banking options (see Figure 6). This suggests that other factors such as industry co-operation, privacy and security concerns, and cost-benefit analysis as well as payment habits have to be favourable for widespread use. An important issue is whether merchant and customer banks need to be the same, a fact that would require merchants to have accounts with a range of banks. Cross-border payments and micropayment are challenges to established banking payment systems, an important reason being the large overhead and transaction costs that are charged.

*Ease to obtain*. Obtaining the online payment option via online banking is straightforward as the possession of a customer account and subscription to online banking automatically allows use for on-line payments provided that merchants accept them.

*Cost*. For merchants setup costs are relatively low as the payment is effected via the bank's payment facilities and they do not need to install particular payment services and security devices. Also, the system allows existing networks to be used and does not require the creation of a new one. Important merchant costs may be entailed if merchants need to set up arrangements with a wide range of banks, but costs can be contained if banks co-operate or provide similar systems to allow scale economies.

*Security.* Banks have frequently implemented supplementary security provisions beyond the standard use of a password and PIN. One development is the use of one-off passwords for authentication, which cannot be re-used. E-banking also often applies multiple authentications to improve payment security – the consumer has to provide several confidential pass codes to access a personal account. Compared with alternative hardware systems, these are relatively low cost solutions.

The online payment option may be integrated into the shopping process, but it may also be used to pay after the purchased item has been received. This provides additional security to buyers and its availability may encourage consumers who distrust online shopping to purchase on the Internet.

**Electronic currency systems**

***Smart card systems***

In the early stages of the online payment market new products such as Cybercash or DigiCash, were proposed (OECD, 2000). However, they had little success and most of these instruments have disappeared. Currently, smart card-based systems are most commonly used to pay small amounts within organisations (*e.g.* vending or copying machines). They usually rely on specialised hardware and dedicated smartcard readers for authentication.

***Online cash systems***

A number of online cash systems designed for online purchases such as Virtual BBVA clic-e[23] (Spain) have been implemented, and there are similar payment mechanisms in Italy,[24] Austria[25] and Australia (*e.g.* PAY offered by SNAP). Online cash systems are software-only electronic money instruments based on "signed" money. They usually work via prepaid cards, and arrangements differ although most require merchant subscriptions. Electronic tokens representing a certain value are exchanged in a similar way to cash.

*Characteristics*

*Applicability.* The user base for new electronic currency systems is initially necessarily small. Often only a few merchants accept the new payment means so that it is not perceived by consumers to be a payment option. However, these systems can be built on widely available networks. For example, the prepaid cash system of the Italian Moneta Online offers a temporary Visa card that permits buyers to pay on merchant Web sites where there is Visa card acceptance. The question is, however, whether this is a feasible business model for new payment system providers. Consumers have to perceive an advantage in this system over available alternative options.

*Cost.* There are different costs for prepaid card and smart card systems. Prepaid accounts such as scratch-cards have physical card and distribution costs as well retailer commissions. For smart cards there are additional installation costs for consumers, as specific software and hardware are generally necessary for online use. Both electronic currency systems may also require large databases to prevent abuse such as double spending, adding a further overhead cost. Overall, these systems potentially have large transaction costs that may limit their use in some applications.

*Anonymity.* Electronic currency systems potentially allow anonymity in the same way as paper currency in offline transfers. However, providers may require consumer registration and undermine the potential for anonymous payment of these systems.

**Box 2. Consumers and online payments – a German survey**

Online payments are not currently surveyed in detail in internationally comparable official consumer surveys. For non-official surveys there are many differences including questionnaire phrasing, sample selection and other methodological issues, and questionnaires with simple "yes" and "no" options often do not provide adequate insights into consumer behaviour. Furthermore because payment system availability and use are very diverse across countries, national results cannot be generalised to all OECD countries. For a recent overview see also OECD, 2005b.

However, a series of German surveys based on a large number of online respondents provide a detailed overview of online payment behaviour and consumer attitudes in Germany (Krueger, 2004).[26] Survey results include:

*Mobile payments:* In the experience of respondents, mobile payments were not generally available at merchant sites. Not all respondents were fully convinced of the security of this payment method. However, the possibility to use the payment from anywhere was considered important, and many respondents saw the payment process as simple and fast and found it useful.

*Online banking*: Many respondents found this a widely applicable payment option, and emphasised that online banking enables more control of transactions. For non-users, some respondents mentioned perceived lack of security as a factor.

*Credit cards*: A large majority of consumers found this method to have wide applicability providing an easy payment option. Various respondents who had not used credit cards said that the timing of account debiting and security concerns were major reasons for non-use.

*Billing system*: Consumers did not find this payment option on many websites. Many who said they did not use these systems mentioned that they would need to invest time to consider the advantages among other reasons.

*Prepaid systems*: Limited availability of this payment option was an issue. There was also uncertainty with respect to the security of this payment option and many found they were not financially secured with the payment method.

Horizontal issues surveyed:

Consumers preferred using the payment option they had already adopted to trying other payment options. Reasons may be that they were unwilling to invest time to consider other payment systems or that they simply did not find any inconvenience with the payment system they were using.

The timing of payment compared with receipt of goods seems to be an important factor, explaining the success of offline systems such as cash on delivery.

Consumers did not find the possibility to pay large/small amounts was a major problem for any payment system.

When asked what should be done to make Internet payments more attractive, respondents most frequently mentioned legal safeguards and more information on liability in case of product damage, suggesting that consumer protection issues are important. Other aspects mentioned were standardisation and simplification of Internet payment methods.

*Source*: Section for Money and Currency, Institute for Economic Policy Research, University of Karlsruhe.

## Micropayments

Micropayments for transactions under EUR 5 are of growing importance for purchase of low price items, and small payments of less than EUR 1 for instance for newspaper articles, are currently increasing.[27] Other examples include digital content such as single music tracks, single games play, press articles and academic papers. There is evidence of a rise in supply of low-priced online content, and according to Gartner, 44% of retailers affirm they have goods and services to sell if micropayment systems existed, and users are increasingly willing to pay for low-cost Internet content.[28] However, this is still a developing market.

A central issue in developing micropayments is that traditional systems were originally designed for relatively large payments. For example, credit cards have a fixed transaction fee combined with a percentage of the transaction cost and are expensive for micropayments. Typically, the costs of micropayments are in the range of 30-40% of the purchase value. New mediating services are beginning to recognise the potential importance of micropayments, and specific tariffs are offered for digital content (*e.g.* PayPal tariffs for individual music downloads). PayPal is one of the leading micropayment firms together with Bitpass, Peppercoin, Opass and Payment One.

***Different micropayment systems***

There are a large number of competing micropayment systems including: *i)* direct-to-bill, *ii)* aggregation (to form a single larger transaction), *iii)* pre-paid accounts and *iv)* direct transfers.

*Direct-to-bill*. A proposed payment solution is direct-to-bill payment via telephony. An example is the Vodafone/T-Mobile m-Pay Bill, which is intended for small transfers. It allows either to charge the telephony bill or to debit from pre-paid credit. Another system is the Coinlet system by Portalify (Finland), which provides for premium-rate SMS and voice. Such payment systems are not widely offered as yet and frequently do not permit international payments.

*Aggregation.* Cumulative collection/aggregation services are a frequently used development (Paunov and Vickery, 2004). Individual transaction expenditures are summed once a month for payment. This service may be offered by a micropayment organisation connecting to a range of merchants. Examples are Cartio Micropayments and Clickshare, similar payment systems have been introduced in Germany (FIRSTGATE Click & Buy and Micromoney) and Denmark.[29] An alternative option is to add the cost of transaction to existing monthly bills (usually telephone bills). A further mechanism consists in merchants themselves aggregating consumer expenditures.

*Prepayment.* Prepaid systems also have potential for micropayments (*e.g.* Paysafecard[30] and Micromoney in Germany). The card is for one time use only and contains no other information than a 16-digit PIN concealed under scratch foil. New Zealand with Payex has also developed these kinds of instruments. However none of these payment mechanisms have been widely taken up.

***Prospects***

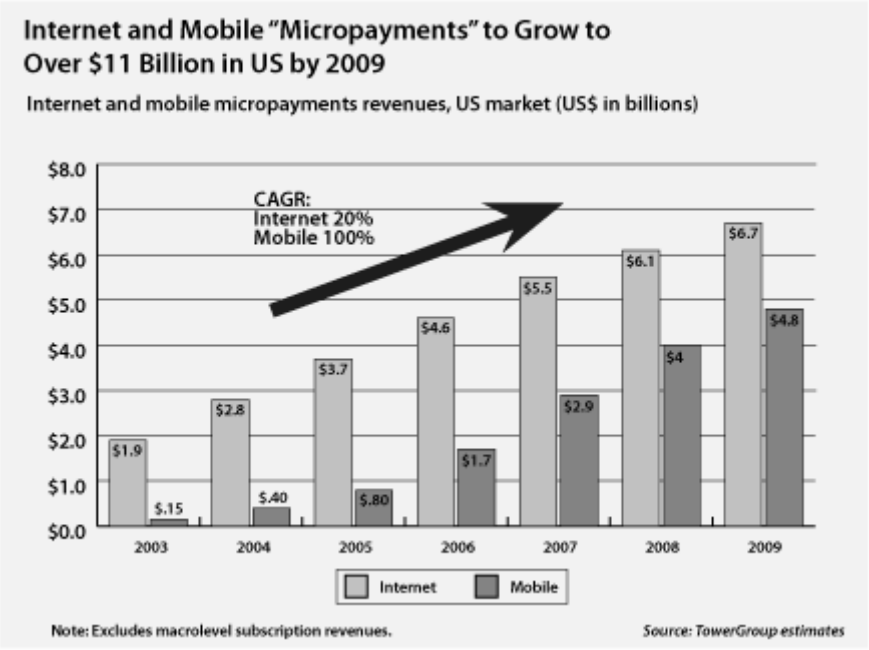
There are challenges for the future development of micropayment systems. So far, the two major online payment system providers, credit card companies and banks, have not identified this market as a priority and profit margins are generally low. For payment provider Visa, existing aggregation models provide a micropayment solution and so far no alternative business model to support investments in micropayments systems has been developed. According to the company, aggregation models present an optimal solution to consumer demands.[31]

Other established providers, including telecommunication service companies, may become more involved. They have long-standing experience in micropayments, as phone calls in essence are micropayments. Some (*e.g.* Deutsche Telekom) have decided to become providers of online payment systems (see T-Pay discussion above). However, other mobile telecommunications providers are still exploring the role they want to play in this market. For European companies, this may partly be related to the direction of the E-Money Directive (see below). Another challenge is that it has been difficult for payment system providers to gain a wide user spread and a number of systems have failed.[32] Finally, there are no common micropayment platforms that allow interoperability of different systems across national borders; the failure of Simpay (see above) suggests that for m-payment solutions this will persist.

Further, there is an advantage for merchants to have consumer subscriptions rather than one-off payments. These provide more stable income flows to merchants and increase knowledge of customers and their purchasing habits. Consumers could benefit potentially if the result is more customised offers. At the same time, privacy issues arise. The advantages of aggregation services for payment providers (*e.g.* credit card systems) and merchants mean that there is less market pressure to develop alternative micropayment options.

It is projected that the "direct-to-bill" option via mobile phones will grow rapidly. For Internet-based solutions it is expected that aggregation-based systems will grow in importance along with prepaid payment options (see Figure 10 for the United States). However, given the current weakness of prepaid solutions (apart from mobile prepaid payments), it remains to be seen whether these will develop. Aggregation/cumulative account systems and mobile solutions[33] may become dominant systems.

**Figure 10. Evolution of Internet and mobile micropayment revenues in the United States**




*Source*: Tower Group (2004).

### International electronic payments

Credit cards are the almost exclusive payment mechanism for international payments. Many alternative payment systems are not usable across borders. A recent US study found that end users and financial service providers consider cross-border payments to be costly and cumbersome and that there are few incentives to develop faster and lower cost systems. Moreover, the small volume (1-2%) of US cross-border payments relative to domestic payments is a significant challenge to establishing a critical mass that will lead to decreasing marginal costs for such services (Federal Reserve Bank of Chicago, 2004). However B2C (and particularly B2B) cross-border payments are relatively more important in smaller national markets and recent evidence suggests that international e-commerce is growing.

### Additional services offered by payment providers

Intermediaries increasingly provide partial or complete services to merchants to deal with e-commerce payment and related issues.[34] These include technical solutions for online payments and

ensuring transaction security, and also providing services so that smaller merchants can accept a variety of payment systems.

Some payment systems also offer consumer protection. Mediating service provider PayPal offers a Money Back Guarantee that allows buyers to return merchandise and be reimbursed. Online payment services may give buyers an option to have additional protection in the event of dispute, reimburse dissatisfied buyers or provide insurance against fraud, and it has been suggested that mediating services may have a relative advantage to resolve disputes between buyer and seller (Sorkin, 2001).

**Security for online payments**

There are two main systems for transaction security, secure socket layer and secure electronic transaction (OECD, 2000).

***Secure Socket Layer (SSL)***

SSL is the widely used secure service system and is an important measure to establish trust between online seller and buyer (OECD, 2005b). Encryption and decryption allow secure transfer of information between an Internet browser and server (*i.e.* between buyer and seller). Data cannot be intercepted or changed during transmission. SSL also permits merchant identification through SSL server certificates. The SSL standard has been widely adopted because it is relatively simple and easy to use and does not place excessive demands on the average consumer's home PC, while at the same time reducing major concerns about the public nature of the communication infrastructure.

SSL has an over 90% share of security measures, about the same as credit cards among online payment systems. According to Netcraft's SSL survey, in July 2004 there were 305 000 secure servers in the OECD area (Table 4), an increase of about 47% since 2002. The data have been weighted by population in order to facilitate cross-country comparisons. However, there are limitations to comparability as there is a higher degree of centralised use of secure servers in some countries than in others (OECD, 2005b). Until recently, SSL provided services exclusively for fixed networks. But as mobile networks are increasingly important e-commerce markets, SSL services for wireless devices have been developed. For example, since July 2004, GeoTrust offers SSL certification to ensure secure access to Web-based applications from mobile wireless devices (OECD, 2005b).

**Table 4. Secure servers in the OECD area**

| | Secure servers July 2002 | Secure servers July 2003 | Secure servers July 2004 | Per 100 000 inhabitants July 2002 | Per 100 000 inhabitants July 2003 | Per 100 000 inhabitants July 2004 |
|---|---|---|---|---|---|---|
| Australia | 4 693 | 4 830 | 8 079 | 23.8 | 24.5 | 40.9 |
| Austria | 949 | 1 073 | 1 590 | 11.8 | 13.3 | 19.7 |
| Belgium | 439 | 512 | 912 | 4.2 | 5.0 | 8.8 |
| Canada | 7 768 | 9 378 | 15 166 | 24.7 | 29.9 | 48.3 |
| Czech Republic | 185 | 213 | 315 | 1.8 | 2.1 | 3.1 |
| Denmark | 660 | 890 | 1 681 | 12.3 | 16.5 | 31.2 |
| Finland | 744 | 870 | 1 255 | 14.3 | 16.7 | 24.1 |
| France | 2 511 | 2 646 | 3 799 | 4.1 | 4.3 | 6.2 |
| Germany | 7 987 | 7 912 | 13 163 | 9.7 | 9.6 | 16.0 |
| Greece | 170 | 181 | 270 | 1.6 | 1.7 | 2.5 |
| Hungary | 86 | 122 | 199 | 0.8 | 1.2 | 2.0 |
| Iceland | 136 | 170 | 249 | 47.3 | 59.1 | 86.6 |
| Ireland | 579 | 701 | 1 201 | 14.8 | 17.9 | 30.7 |
| Italy | 1 167 | 1 327 | 1 977 | 2.0 | 2.3 | 3.4 |
| Japan | 7 179 | 10 513 | 19 610 | 5.6 | 8.2 | 15.4 |
| Korea | 562 | 623 | 878 | 1.2 | 1.3 | 1.8 |
| Luxembourg | 97 | 104 | 184 | 21.7 | 23.3 | 41.2 |
| Mexico | 324 | 379 | 605 | 0.3 | 0.4 | 0.6 |
| Netherlands | 1 332 | 1 723 | 3 595 | 8.2 | 10.7 | 22.3 |
| New Zealand | 983 | 1 124 | 1 668 | 24.7 | 28.3 | 42.0 |
| Norway | 528 | 666 | 1 122 | 11.6 | 14.7 | 24.7 |
| Poland | 373 | 382 | 557 | 1.0 | 1.0 | 1.5 |
| Portugal | 214 | 286 | 443 | 2.1 | 2.8 | 4.3 |
| Slovak Republic | 38 | 47 | 61 | 0.7 | 0.9 | 1.1 |
| Spain | 1 315 | 1 764 | 2 745 | 3.2 | 4.4 | 6.8 |
| Sweden | 1 246 | 1 437 | 2 826 | 14.0 | 16.1 | 31.7 |
| Switzerland | 1 555 | 1 769 | 2 826 | 21.2 | 24.1 | 38.5 |
| Turkey | 400 | 432 | 855 | 0.6 | 0.6 | 1.2 |
| United Kingdom | 10 288 | 11 714 | 20 339 | 17.4 | 19.8 | 34.4 |
| United States | 106 884 | 120 661 | 197 769 | 37.2 | 42.0 | 68.8 |
| OECD | 161 392 | 184 449 | 305 939 | 14.1 | 16.1 | 26.7 |

*Source:* OECD, 2005b based on Netcraft surveys (www.netcraft.com).

### *Secure Electronic Transaction (SET)*

SET is an alternative, more complex security system based on digital certificates and signatures.[35] SET needs specific software and is more difficult for cardholders to obtain and use, and despite the high level of security offered it has not gained widespread use.

### *Provision of security information*

In contrast to offline transactions, online commerce does not involve personal contact during the payment transaction, and the quality and level of information provided to consumers matter to a greater extent. However a recent survey of European Web sites found significant information shortcomings for e-commerce Web sites, and a significant number of them did not provide comprehensive information on transaction security measures adopted, nor measures to educate consumers (PwC, 2003).

*Network security*

More generally regarding network security, because of the ubiquitous nature of the Internet and potential threats to and vulnerabilities of the networked world, governments and businesses have become increasingly aware of the need for a culture of security among all participants to protect national and international systems and networks. The 2002 OECD *Guidelines for the Security of Information Systems and Networks* is one example of these concerns and the response suggests nine principles for participants: *i)* awareness, *ii)* responsibility, *iii)* response, *iv)* ethics, *v)* democracy, *vi)* risk assessment, *vii)* security design and *viii)* implementation, *ix)* security management and reassessment. The role of private industry is critical to promote this culture of security, as they build, maintain and use the networks upon which information is shared and used, such as payment systems (OECD, 2002b).

**Summary**

Although there is a large range of online payment systems, credit cards for payment and SSL for security are dominant. However, there are significant differences across OECD countries, and other payment methods are of importance in some countries. Innovative new payment options have not often succeeded in replacing established ones. Particular niche markets are also the exceptions, most notably the auction market where mediating service provider PayPal established itself. The area of micropayments has seen a range of developments but none has achieved sufficient reach and practicality to substitute the more prevalent subscription systems as the payment option.

A central challenge for payment methods is to provide authentication mechanisms that allow both secure payments and convenience of the transaction process. A number of new solutions, such as Verified by Visa have been proposed or are being developed (*e.g.* by PayPal). As mobile phones provide additional authentication possibilities without the need for additional hardware, this gives them some advantage in developing secure and convenient payment systems.

Credit cards for online payments have a large user-base and benefit from familiarity and simplicity of use and also allow international payments. Security is being addressed via new modified credit card payment solutions. Micropayments have not been extensively addressed, in part due to potentially high transaction volumes compared with low cash value. Debit cards are an alternative payment system, especially where they previously enjoyed popularity for offline payments and where they enjoy a broader user-base on the consumer side. However, they cannot be used in international payments in the majority of cases. Further, debit cards are not currently suitable for micropayments. Mediating services can be used for person-to-person payments, and cost savings in clearing processes may allow them to become a cost-efficient payment means.

Using mobile devices for payments has major potential due to the very large user base and familiarity with mobile phones and billing systems. Costs are potentially low (payments added onto an established payment system), security can be established with extra personal pin-numbers, and micropayments can simply be aggregated into overall payments. Challenges exist in relation to international payments and there is the question to what extent new intermediaries (mobile operators) can act as financial intermediaries. Electronic banking systems have a large user base and established network, and banks have well-established procedures and security systems for online banking. International payments and micropayments remain challenges and the relatively low offer of e-banking for online purchase in several countries suggests that these systems still need further development to become widespread payment options. Electronic currency systems have not had high levels of uptake despite their potential for small and varied payments and anonymity; however, overcoming network and cost constraints pose significant challenges.

**Table 5. Summary of selected characteristics of online payment systems**

| | Applicability | Ease to obtain | Reliability/ease of use | Cost |
|---|---|---|---|---|
| **Credit cards** | Widespread user base given long-established network. Not developed for micropayments (except for aggregation systems) or person-to-person payments | Easy to obtain and no additional expenses required to use credit cards on line. Some groups (young, those not qualifying) may not have access to credit cards | Relatively easy to use given wide experience with credit card payments. Analysis shows up to one third of transactions do not end in payment, possibly mostly due to incorrect information entry. A small share of rejections (around 3% of total) due to possible fraud (Pago) | Fee for merchants between 2-6% plus monthly fee plus "chargeback", but differences across countries, banks and contracts. Consumers pay for (existing) card. |
| **Debit cards** | Wide user base among buyers, but country-specific spread among merchants. Limited to national payments, not yet developed for micropayments or person-to-person payments | Easy to obtain and no additional expenses to use on line. Often less requirements to obtain debit than credit cards | Experience with debit card for cash withdrawing and other payments suggests easy to use on line. No data available on reliability/rejection rates | Differences across banks and countries. Consumers pay for (existing) card. |
| **Mediating services** | New services appearing. PayPal has already wide user spread particularly for auctions, and person-to-person payments. Being developed for micropayments | Consumers have to sign up with the service, but use is then easy by charging account through credit or debit card system | Easy to use, but difficulties include frozen accounts and sales through multiple identities. No data on reliability/rejection rates | Fee for merchants 2.2-2.9% and USD 0.30 per transaction. Free for consumers apart from basic payment for (existing) card. |
| **Mobile payments** | Potential of greater applicability given widespread use of mobile phones, high potential for micropayments but development of international system represents a challenge | Easy to obtain for systems such as Premium SMS, registration required and more difficult to obtain for payment services such as Paybox | Some uncertainty among consumers, and often lack knowledge of how to use mobile devices for payment. No data on reliability/rejection rates | Variable across systems, and cost structures not yet clearly established. For Paybox merchant and consumer are charged |
| **Payment via online banking** | Widespread user base on consumer and merchant side, but only established for online sellers in a few countries. Usually limited to national payments, not ideal for micropayments (except for aggregation systems) | Straightforward provided the consumer bank has an online banking facility | Longer experience with online banking suggests that users will find payments familiar and easy to use. No data available on reliability/rejection rates | Usually few extra costs for merchants and no extra security screening/systems necessary. Maybe consumer charges |
| **Electronic currency** | Wide user base not yet attained for the wide variety of mechanisms. Potential usefulness for micropayments | Only a card or similar instrument is purchased. Usually need to purchase at points of sale. No account has to be built up. May require special readers and software for smart cards | Consumers may lack knowledge of how to use. No data on reliability/rejection rates given limited usage | Substantial costs involved with distributing pre-paid cards and setting up monitoring systems For smart cards, merchant and consumer face cost to install hardware |

*Source*: OECD.

## THE ONLINE PAYMENT INDUSTRY AND NETWORK EFFECTS

This section analyses the payment systems industry focusing on network effects and their impacts on the successful introduction of new payment options. Online payment systems are platforms that are most useful when they have very wide coverage and preferably high interoperability among competing systems, similar to other network industries. This suggests that beneficial competition will not arise through building different incompatible systems but rather through the provision of different kinds of services over common networked platforms.

### Industry characteristics

#### *Actors*

The main actors in the online payment industry are: *i)* banks, *ii)* credit card companies, *iii)* telecommunication providers, and *iv)* new entrants to online financial services. Traditionally, banks and since the 1960s, credit card companies have dealt with the provision of payment systems. These two are established insiders. Telecommunication providers have shown increased interest in the area of mobile payment means. There are other new entrants into the financial services industry often providing novel systems and new services have been set up to provide innovative means of payment (sometimes as subsidiaries of established actors). This diversity, with long-established companies and new entrants, creates a heterogeneous market environment.

Moreover, merchants and consumers have certain impacts on the payment industry. Small and large online merchants have different requirements and make different uses of payment systems. There is a tendency for smaller (but also other) merchants to purchase payment services from specialised firms, outsourcing the payment side of e-commerce. This has lead to the emergence of new providers. In contrast, larger e-commerce sellers such as Amazon have been internalising payment functions. However, the basic payment operations are usually handled by banks. Similarly, consumer use of other payment systems such as online banking or mobile systems will affect the development of the online payment industry both nationally and internationally.

Finally, the payment systems industry involves governments, standard-setting organisations and industry co-ordination groups that have direct impacts on industry structure and competition.

#### *Unbundling of financial services*

In parallel with development of online payment systems, related financial services are being offered by different actors. Banks traditionally provided all aspects of financial intermediation but now there is some “unbundling” of transaction services by third-party providers, introducing an additional layer into the payment process. These third parties often deal with consumer authorisation, customer service and merchant enrolment, and only the traditional clearing role remains with the financial institution (Mantel, 2002). Further services include administration of online pricing, billing and payment platforms (*e.g.* All Charge[36]).

***Lock-in effects***

Online payment systems provide a payment platform allowing financial transactions between buyer and seller. The number of buyers and sellers using a payment system determines its value. For example, cardholders value credit or debit cards to the extent that merchants accept them and merchants will accept them to the extent that buyers use them. Larger numbers of users may in turn engender better legislative protection and further enhance the value of the widely used system. The existence of such positive network effects is likely to lead to *"winner-take-most*" markets, creating powerful incumbents and tending away from perfectly competitive markets (*Economides*, 2003).

In such a *two-sided platform market,* buyers and sellers interact through a common platform. Success for new platform entrants depends on getting both sides of the market to participate – the traditional "chicken-and-egg problem". New entrants may also adopt a variety of pricing strategies and pricing levels to optimise revenues (see *e.g.* Rochet and Tirole, 2001), and these may also determine uptake and structure of the new payment system.[37] Furthermore, there can be resistance to change in the supporting infrastructure network because large, long-term investments and sunk costs are necessary for a stable and reliable infrastructure.

One consequence of these characteristics is that a new network is of little benefit if few adopt it, and there is the possibility that a less-efficient network standard may be adopted (see *e.g.* the QWERTY standard, David, 1985). However competition from new entrants may allow switching to new standards (Liebowitz and Magolis, 1990) depending on the intensity of *lock-in effects*.

Recent evidence on the strength of payment network effects shows that merchant acceptance of a system and consumer use are correlated so that low merchant adoption hampers consumer use (Rysman, 2004).[38] On the side of merchants lock-in seems to be decreasing slightly as data suggest that currently about 45% of all North American e-commerce sites offer two or more payment methods, which may be interpreted as lessened lock-in to specific systems (Saunders, 2004). On the other hand, there is also some evidence that a single unified payment means is seen as important by consumers and that they may prefer lock-in to unified systems.[39]

The success of new payment systems in attracting users may also suggest that lock-in is not insurmountable. The mediating payment service PayPal has successfully expanded despite the availability of established payment systems. However it relies on the credit card network, and whether its service can develop and rely less on the credit card network is an open question. In general, new payment systems superposed on existing networks[40] may provide a rival to existing networks or may further strengthen them (see Mantel, 2002).

**The role of banks**

The key asset for banks in the online payments business is that consumers often have relatively high trust in their banks. This is a valuable advantage over other providers.[41] Banks have developed online banking services to take advantage of the widespread availability of ICTs and the Internet to lower their costs and expand their reach. For some countries, these services have been extended to permit online purchase. In others, debit payment options are increasingly available for buyers for online purchase and banks have shown an interest in providing related services.[42] Also, traditional bank-based means of payment – that is forms of offline payments – often permit consumers to buy online. The importance of banks in providing online payments differs across countries and depends partly on specific market characteristics. For instance, whereas in some countries (*e.g.* Germany) non-banks play an active role in providing online payment solutions; in others (such as Italy) banks have taken the lead in providing online

payment solutions. However this does not mean that in terms of absolute importance these measures are likely to become as important as the leading system, credit card payments.

***The role of "new" institutions***

PayPal is an example of a successful payment service provider although the company does not aim to become a bank. With 45 million account holders, and growing internationally, it has the equivalent of one fourth of the number of Citigroup account holders (*The Economist*, 2004b). But with the growth of mediating services banks have also strengthened their involvement in this market segment.[43] In some countries business associations are active in providing online payment systems. For example, the online real-time debit transfer scheme proposed by the Japanese Inter Debit is operated by the Japan Internet Promotion Association, as of end-2004 an alliance of 183 institutions of which 94 are financial institutions.

In other countries non-financial institutions have become important providers of online payment solutions (*e.g.* Banksys in Belgium). Non-financial institutions are particularly important in developing innovative payment solutions. In a sample of 100 schemes reviewed in 2002, the ePSO ePayment Systems Database found that non-banks were often involved in more innovative projects than banks (Carat, 2002). But this does not necessarily translate into success, which depends more on an established broad user base and network effects.

***Trends and new roles***

With the importance of account-based payment systems, banks will remain important market participants. However, they have not always succeeded as direct service provider for online payments. Certain functions in the value chain have seen a substantial rise in alternative providers, particularly functions most directly related with customers including the payment system interface or customer support systems (Kaufmann-Winn, 1999, Chicago Fed Letter, 2001). In the unbundling of financial intermediation, some industry analysts suggest that banks may be losing out, and that non-financial institutions have taken the lead in providing new services such as administrating online payment platforms (Carat, 2002).

In the developing mobile payments markets banks may face important challenges from telecom operators, depending on national banking regulation. A potential development is co-operation in joint projects, *e.g.* providing banks with the ability to have their online information on the mobile device, and competition will not necessarily lead to banks losing out to telecommunication service companies.

**Summary**

Payment systems are provided by the traditional market participants, banks and credit card companies, and by telecommunications firms and new financial services providers. These face an evolving merchant demand side ranging from increased internalisation of payment service functions to their complete outsourcing. Further, governments, regulatory agencies and industry associations are important factors in the market. The two-sided platform market has positive network effects and significant infrastructure investment costs. As a result there is a likelihood of lock-in to established dominant networks. A number of market characteristics support lock-in although this is not the case for all payment systems and mobile payments are emerging as a viable alternative payment option. Banks retain an important position in the market, credit card companies have a very high share of transactions and new actors are challenging banks in providing services especially in those parts of the value chain directly related to consumer services.

## DRIVERS AND IMPEDIMENTS TO DEVELOPMENT OF ONLINE PAYMENT SYSTEMS

This section discusses some of the drivers and impediments to the development of new online payment systems and identifies some of the main issues to be discussed in the last section. Three different approaches can be taken to the development of consumer online payment markets (Mantel and McHugh, 2001). One approach emphasises that there are significant institutional, design, competition and/or customer irrationality challenges that may require public sector involvement. A second suggests that market forces will allow development of an optimal payment market as long as efficient solutions are identified by consumers, merchants and financial providers and steps towards their implementation clearly planned, *i.e.* efficient co-ordination among all market participants is necessary (see Caskey and Sellon, 1994). A third approach argues that markets are efficient and that as a consequence optimal results can be achieved even without co-ordination, despite network effects. Aspects of these three different approaches are discussed in this and the next section.

### Supply side drivers and impediments

#### *Network effects*

The established financial institutions, credit card companies and banks, have significant market position due to the advantages they derive from their established networks. The mediating service PayPal has successfully challenged this position in the auction market, but many new entrants have failed because of their inability to establish an equivalent user base. Telecommunications companies are interesting new participants, provided that they succeed in developing payment options and to the extent that regulations allow them to operate as payment intermediaries.

#### *Costs*

An important factor contributing to lock-in to established payment systems is the long-term infrastructure investment needed to develop and set up alternative systems. Also initial maintenance costs are significant before payment methods may reach and retain an important number of users; New services will initially incur losses before being able to see the benefits from their significant sunk costs. Given the importance of investment costs, Mantel and McHugh (2001) argue that this is a better explanation of potential lock-in to established systems than network effects. However, high initial costs and delayed return on investment are a direct consequence of positive network effects as users (merchants and consumers) are slow to shift to new services before a significant number of other users have done so. Thus the way network effects work contributes to this cost structure.

#### *Standards and co-ordination*

Use and interoperability of systems across borders is an important driver for successful payment systems, and a major impediment for new methods. Difficulty in establishing cross-border payments via mobile devices is a major challenge; national differences and competition among providers are likely to retard the process and to significantly increase the cost for payments. Various firm-specific standards may act as obstacles to adoption, rendering the m-payment option less attractive than would be the case if a common system was agreed on.

Standardisation can be important to achieve high levels of uptake. The experience with payment via online banking in Finland illustrates this. The co-ordination efforts of Finnish banks gave the key for success of this payment method, even though the payment model in general has significant capabilities. Banks agreed on operational rules and standards and arranged to provide a unified interface for Finnish e-banking, which seems to be a major reason for its success (Kallio, 2003).

However despite the positive results from co-ordination and standard-setting for e-banking payment systems in Finland and similar examples, banks (and other actors) do not always co-operate, often due to free-rider concerns. Banks may be unwilling to invest if there is uncertainty that others will also invest. This may be a particular impediment if only joint bank investment will achieve a critical mass of consumers, for example in international payments, which may not be profitable for single company investment (Federal Reserve Bank of Chicago, 2004). In general, co-ordination involving many participants involves significant costs. The success of Finland's online banking was facilitated by only a few banks having to co-ordinate activities. Further, if different systems are already in place, this creates additional problems, including adequate compensation for past investments in separate systems.

***Regulations***

A range of regulations affect the development of payment systems, and which institutions can enter different markets. For example, can only banks issue electronic currency? Can non-banks offer mediating payment services? What regulation applies to those providing online payment services only? Answers to these questions play an important role in shaping conditions for entry and the power of established banks and credit card institutions.

**Demand side drivers and impediments**

***Consumers and online payments***

There have been continuing consumer concerns over online payments and especially online credit card payments. This has been consistently raised as one of the main reasons for consumers not buying on line. Some of these concerns refer specifically to online payments whereas there are also more general concerns related to e-commerce and the Internet in general. Surveys confirm that many consumers are preoccupied with fraud when it comes to online payments; this is revealed by surveys of US consumers (Ipsos Insights, January 2004) and similar surveys in Australia, Canada and the United Kingdom. Privacy and security issues also explain why consumers do not pay onl ine. For example Korean consumer surveys found that these concerns as well as fear of possible fraud were important reasons not to purchase (Korean Statistical Office, 2003). There are also other worries such as distrust in the confidentiality and security of personal information provided (Ipsos Public Affairs, December 2003). For a recent overview of various aspects of indicators, on-line trust, including measurement issues and the need for more reliable and comparable surveys, see OECD 2005b.

However, whereas the surveys identify consumer concerns over security; the total number of online shoppers and purchase values has increased rapidly and various payment systems have improved security features. There is also increasing trust in online payments, especially among younger people and experienced Internet users. The limited time series data and other evidence support the idea that experience with the Internet and other specific e-systems reduces consumer preoccupations over security. In the case of credit cards, the development of new alternative secure payment methods (one-off credit card numbers, "Verified by Visa" and similar systems) has contributed to reducing security concerns. However, there are new challenges to Internet security and they have to be dealt with as they arise to further reduce security concerns.[44]

*Consumer attitudes*

Lack of trust in the Internet is an important factor to explain why consumers do not purchase on line. For example in the European Union in 2003, 25% of those surveyed did not use e-commerce for that reason (Table 6). The economic benefit of trust comes from reduction in transaction costs, including those associated with information asymmetries. The adoption and increasing usage of ICTs and subsequent emergence of global electronic commerce heightens the importance of trust mechanisms[45] (Guerra and Zizzo, 2003, Alessina and La Ferrara, 2000).

Security of online payments is not exogenous to consumer behaviour. For example password selection is essential, as easy words are often chosen (*e.g.* related words or easy combinations) and this weakens the security of password authentication. Further, with the increasing ubiquity of the Internet the growing incidence of "phishing", [46] malware and other criminal activity heightens the importance of consumer awareness. In very large part, the security of the consumer and consumer computer systems depends on the consumer, as banks and other financial intermediaries can only secure information transfer and their own systems. The consumer has to ensure that they behave responsibly, no dangerous programmes are downloaded, new software versions are used, and anti-virus programmes and firewalls are installed and properly configured and maintained (BdB, 2004).

**Table 6. Reasons for not buying over the Internet in EU countries, 2003**
**percent**

| | You do not have access to Internet | **You do not trust Internet** | Using Internet is too expensive | You are not interested in buying anything on the Net | Buying anything over Internet is too complicated | Internet is too complicated | You have no credit cards | You do not understand the language well enough | Other reasons | Don't know |
|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 58 | **20** | 7 | 34 | 8 | 7 | 10 | 4 | 9 | 0 |
| Belgium | 55 | **31** | 4 | 35 | 5 | 6 | 8 | 2 | 7 | 1 |
| Denmark | 46 | **31** | 4 | 34 | 9 | 8 | 9 | 3 | 7 | 1 |
| Finland | 46 | **22** | 3 | 41 | 10 | 6 | 12 | 7 | 8 | 3 |
| France | 66 | **31** | 8 | 22 | 8 | 7 | 5 | 2 | 5 | 2 |
| Germany | 64 | **20** | 9 | 36 | 10 | 9 | 7 | 3 | 3 | 2 |
| Greece | 56 | **27** | 3 | 29 | 4 | 4 | 5 | 5 | 6 | 3 |
| Ireland | 50 | **16** | 4 | 24 | 6 | 5 | 14 | 2 | 5 | 8 |
| Italy | 47 | **26** | 3 | 23 | 3 | 4 | 8 | 1 | 5 | 1 |
| Luxembourg | 42 | **34** | 3 | 28 | 5 | 7 | 7 | 1 | 8 | 2 |
| Netherlands | 36 | **32** | 7 | 33 | 7 | 6 | 16 | 4 | 11 | 1 |
| Portugal | 57 | **20** | 7 | 29 | 6 | 9 | 3 | 3 | 11 | 2 |
| Spain | 56 | **24** | 3 | 21 | 5 | 5 | 3 | 3 | 4 | 1 |
| Sweden | 33 | **37** | 4 | 45 | 13 | 6 | 6 | 5 | 7 | 4 |
| UK | 58 | **22** | 2 | 25 | 5 | 7 | 8 | 2 | 9 | 2 |
| **EU15** | **57** | **25** | **5** | **28** | **7** | **7** | **7** | **2** | **6** | **2** |

*Note:* This question was asked of the 83% of EU citizens responding to the survey who had not used Internet to make purchases.

*Source:* European Commission, Special Eurobarometer survey on *European Union public opinion on issues relating to business to consumer e-commerce* (Reference: 201 EB60.0), March 2004.

Consumer awareness of theft and other criminal behaviour associated with e-commerce has sharpened, and consumers are taking more precautions when buying on line. For example, according to research by the Consumer Reports WebWatch coalition, 86% of Americans surveyed said they changed online behaviour because they were more aware of identity theft and credit card fraud (as quoted in BBC, 2005). There is also some scattered evidence that some consumers may cut online spending as a result. The same survey found that 29% of those interviewed purchased less on line because they know more about

risks associated with e-commerce. With steadily rising e-commerce sales and increasing e-banking, online payment systems have to be continually adjusted and developed to ensure adequate transaction security while providing ease of use, and consumer awareness of their own responsibilities is a necessary condition to limit theft and fraud.

*Familiarity*

There is evidence that those paying on line are often more experienced Internet users and generally have specific socio-economic characteristics such as higher incomes, suggesting that experience and familiarity with the Internet do have an impact on using online payments. Familiarity with payment systems is a further challenge for methods other than credit and debit cards.

*Payment alternatives*

There is some evidence that consumers prefer to be offered a variety of payment options on merchant sites. For example a study by Quality Research Associates finds that sellers accepting four types of payment have more buyers than those offering fewer payment options. Furthermore low cost and convenience of payment are important. Consumers want an easy-to-use means of payment rather than complicated options, and are less likely to use more difficult payment systems. They also want to be fully informed about payment systems (Princeton, 2002). This suggests that convenience and knowledge are important drivers for established methods such as credit cards and impediments for new systems.

*Costs*

In terms of costs for consumers of the payment schemes analysed by ePSO, only a third of the sampled systems charged the customer. Most significant costs for consumers are for hardware (card reader or SIM card) rather than subscriptions or per-transaction fees. For schemes other than smart cards, costs do not seem to constitute a major impediment to payment systems for consumers (for ePSO see Carat, 2002).

***Merchant demand for alternative payment means***

Merchants may also prefer to have other payment means than traditional credit card systems because of liability, reliability and cost concerns. However there is no clear evidence that payment system issues are significant deterrents to merchants offering products on line. The main reasons usually given by firms for not selling on line are the unsuitability of products to be sold on line, unwillingness to change their existing business strategy, concerns particular to firm size (unfamiliarity, delivery, etc.), rather than issues related to payment systems. An exception may be digital content as there is some evidence that effective online payment solutions may lead to a greater supply of products online.

## EMERGING ISSUES

Payment systems are an essential part of the infrastructure for e-business and e-commerce, and there is considerable policy focus on ensuring that payment systems and electronic payment and settlements function appropriately. Electronic settlement and payment issues are among the group of policy areas commonly identified in the *Information Technology Outlook 2004* as being important to enhance the infrastructure for ICT applications, and this is a continuation of the earlier high priority given to this area as reported in the 2002 edition of the *Information Technology Outlook*. A summary list of national electronic payment and settlement initiatives is given in Annex 1. Three areas are discussed in this section, standards and co-ordination challenges, network and competition issues, and better statistical evidence. Trust-enhancing measures and consumer policies - although of major importance for users of payment systems - are not considered in this section. The following discusses some potential topics, but does not provide a list of policy priorities.

### Standards and co-ordination

Industry co-ordination and standards issues cover a range of interrelated topics. Agreements on standards establish common technical rules for payment information exchange and interoperability conditions to allow for the reciprocal use of payment instruments.

Common standards allow economies of scale that lower the cost of payment means. The cost structure for payment systems is such that they generally require significant initial investment but low marginal costs for additional users, and economic viability requires a critical mass of users. A variety of different payment systems and intermediaries and lack of standardisation, especially in international payments, may result in higher transaction costs and make it more difficult to reach this critical mass without co-ordination. Standards and co-ordination issues may become important in the area of micropayments where the usual co-ordination and standardisation by the major banks and credit card companies has not yet occurred. But against these advantages, they may also result in lock-in to established systems and higher costs if they unnecessarily protect higher cost incumbents.

#### *Industry initiatives*

There have been a number of industry initiatives to promote the development of payment systems, for example in the area of mobile payments. The Mobile Payment Forum[47] (including American Express, MasterCard and Visa) was created to standardise features and functions to enable secure m-payments. There have also been efforts at the national level. For example, in Austria four of the five national operators joined forces to offer a single m-payment interface to merchants (One, Hutchison 3G, T-Mobile, Telering). A further interoperability initiative was the formation of the Mobile Payment Services Association (MPSA) in March 2003.

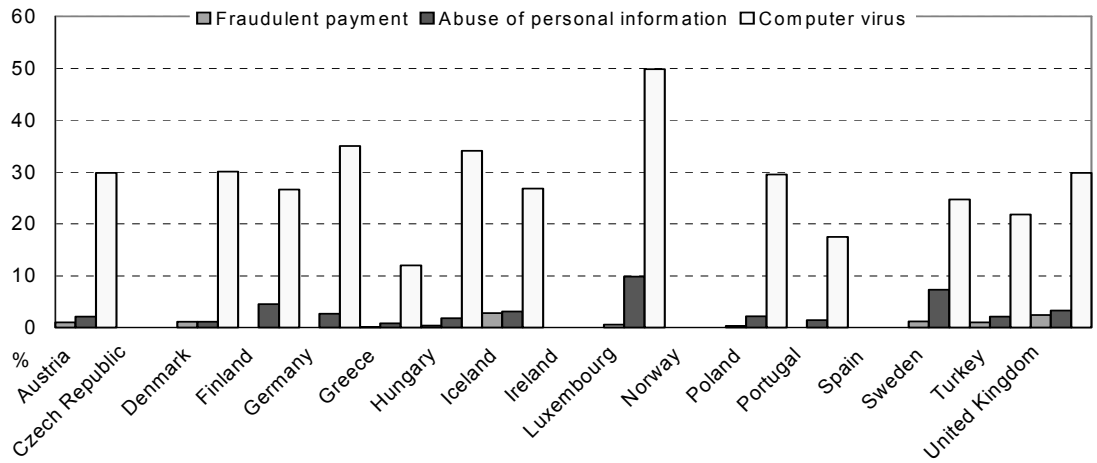
Industry initiatives will not always result in solutions for online payments. For example fragmentation, competitive rivalry and lack of international co-ordination are challenges for developing systems for international transactions and micropayments (OECD, 2004e). There is a clear need for interoperable solutions for electronic payment systems/platforms and the roles of industry in the design, development and implementation of solutions, and of government in setting broader frameworks has been consistently raised (see *e.g.* PwC, 2004).

***Phishing and related issues***

Industry initiatives may also serve to improve the working of online payments. With rapidly increasing online payments and financial transactions, the associated rise of "phishing" and other fraudulent and criminal activity has led the payment industry to co-operate in programmes to raise consumer awareness and address their security concerns. For example a recent Gartner survey of 5 000 online consumers estimated that between May 2004 and May 2005 73 million Internet users received "phishing" e-mails, and although most consumers did not have financial losses, 75% of respondents said they would select online shops more carefully and one in three planned to buy fewer items on line (cited in Cosgrove Ware, 2005). To address this challenge, the Anti-Phishing Working Group,[48] a joint industry association, was created to work with major e-mail providers to impede delivery of phishing-related e-mails. There is also close co-operation between government agencies, enforcement bodies and private industry.

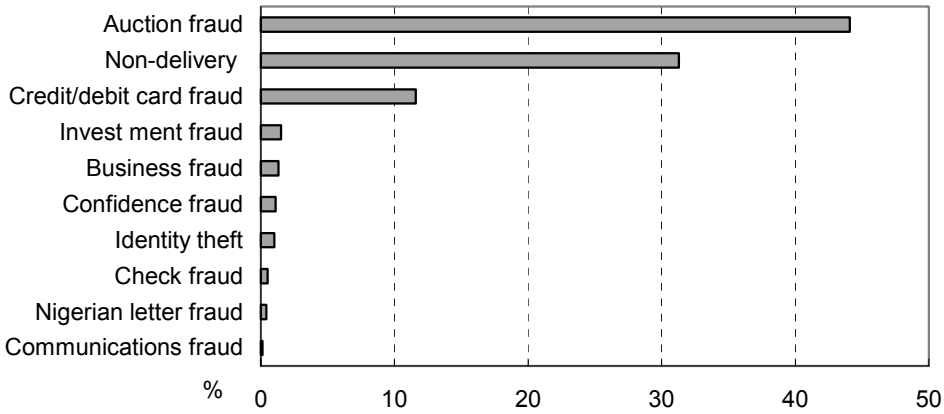
Security more generally is an important factor for e-commerce and online payment systems. Although many incidences of e-crime, computer viruses and auction fraud are not primarily related to payment systems, some are, and they need to be addressed (Figures 11 and 12). A recent OECD publication on trust in the online environment concluded that: "The available evidence all points toward a large increase in e-crime, such as identity theft or online fraud, as being inextricably linked to the rise in ICT use (OECD, 2005b)."

**Figure 11. Share of individual Internet users having encountered security problems in 2004**
**Percentage of individuals who used the Internet within the last year**




*Source:* Eurostat, Community Survey on ICT Usage in Households and by Individuals, 2004, February 2005.

**Figure 12. IFCC, top ten Internet-related fraud complaints, 2002**




Percentages based on the total number of Internet-related complaints (75 063) received January-December, 2002.

*Source:* IFCC, http://www.consumer.gov/sentinel/states03/internet_related_trends.pdf, September, 2004.

### *The payments framework*

Analysis and experience suggest that government involvement is most important in setting the general framework for development, that it be technically neutral and aim at ensuring competition, avoid unnecessary regulation of individual payment systems and not inhibit innovation (PwC, 2004). For the Finnish payment system example, security features were developed by service providers and the Financial Supervision Authority only provided guidelines and standards for IT security and continuity plans.

### *Competition and regulatory issues*

Regulatory questions arise regarding whether and to what extent non-financial institutions (*e.g.* telecommunication service providers) can become involved in providing payment systems, and to what extent these institutions have to then comply with financial institutions regulations. This has direct impacts on competition in the online payments market.[49] Legislative frameworks can also have important side-effects on the development of new payment systems. For example, definitions of micro-payments differ across EU Member States resulting in different legislative or supervisory bodies applying them, which may have a negative effect on the development of inter-European micropayment services (PwC, 2004).

In the European Union the E-Money Directive was introduced in October 2000 to offer protective regulation that would not inhibit market competition (Directive 2000/46/EU). The original objective was to encourage innovation and allow non-banks to enter the e-money market, particularly with the emergence of early e-money systems. For this purpose, the regulation allowed the creation of new institutions, called "electronic money institutions" (ELMI) with lighter regulation than credit institutions. Under the Directive, electronic money must be redeemable for cash at equal value. Also, issuers of electronic money are required to implement safeguards against money laundering (Krueger, 2002). However early systems did not have extensive uptake (most e-money providers remain below the threshold stipulated in the Directive) and a range of different providers including prepaid card providers, mobile operators and payments services providers have entered this rapidly changing market.

The challenge in applying this regulation is to establish what kind of activity qualifies a business to be an ELMI. This led to different applications across the European Union. Especially the question arose with

respect to mobile operators, and whether their payment services qualify them as ELMIs. In April 2004, the Commission launched a consultation to look into how the E-Money Directive should be applied to mobile operators, whether the Directive covers risks appropriately and if it is conducive to the industry's competitiveness (DG Internal Market, 2004). The consultation closed in October 2005 and a report containing recommendations was expected in Spring 2006.

The E-Money Directive provides a common regulatory approach to e-money providers for European countries. However it is an exception, and there is little uniformity in payments across countries. For example, in the United States legislation differs across states, and in other countries, there is not yet a system to regulate online payments. Japan previously adopted stored-value card legislation, but it is not clear how this would deal with electronic money providers such as, *e.g.* PayPal. In other countries legislation is currently being considered.

Despite the desirability of appropriate regulatory standards, in some circumstances the risk of overregulation through duplicative regulatory structures and multiple regulators may be greater than the prudential risks posed by payment facilities (BIS, 2004 report for Australia).

**Payment systems and e-commerce facilitation**

***Assistance to small business***

Some member countries have paid particular attention to assisting small merchants in building up secure online shops including online payment systems. For example, the German *Bundesministerium für Wirtschaft und Arbeit* sponsored regional-level information centres to assist small and medium enterprises, such as the regional *Beratungs-und Informationszentrum Elektronischer Geschäftsverkehr* (BIEG) (http://www.bieg-hessen.de). This institution provides a free information platform where online sellers can register and find other companies for online projects. This is part of the government "Information Society Germany 2006" plan (BMWI, 2003).

***Certificates and awards***

Online merchants can help promote online payment by obtaining and displaying certificates and awards. However proliferation of awards and certificates may not add particular value.[50] A smaller number of widely recognised certificates is important to make them work. Certification does not have to be directly provided by national governments. An example is the Better Business Bureau with 300 000 business members in Canada and the United States, which seeks to foster fair relationships between businesses and consumers. The institution's program, BBBOnLine, identifies good-practice merchants to consumers notably through the Reliability and Privacy "trustmark" programmes. The same group has created the Global Trustmark Alliance with international partners, which has the same goals.

Following the OECD *Guidelines for Consumer Protection in the Context of Electronic Commerce* (1999) and their recommendation of trust-enhancement through trust marks, the UK government worked with the Electronic Business Alliance and Consumers Association to develop a non-profit organisation, TrustUK, to accredit codes of conduct for electronic commerce (OECD, 2003b). There have also been efforts at the level of the European Union towards the development of trust marks.[51] Further action is necessary to raise consumer awareness of these; according to a 2003 Eurobarometer survey, in the EU more than four in five consumers had not heard of Internet trust marks (Table 7).

**Table 7. Internet trust marks awareness in EU countries, 2003**
**percent**

| | Yes | No | Don't know |
|---|---|---|---|
| Austria | 19 | 76 | 5 |
| Belgium | 9 | 86 | 5 |
| Denmark | 16 | 83 | 1 |
| Finland | 11 | 82 | 7 |
| France | 9 | 89 | 3 |
| Germany | 15 | 77 | 9 |
| Greece | 7 | 85 | 9 |
| Ireland | 10 | 86 | 4 |
| Italy | 6 | 90 | 4 |
| Luxembourg | 13 | 84 | 2 |
| Netherlands | 14 | 80 | 6 |
| Portugal | 6 | 92 | 2 |
| Spain | 7 | 85 | 9 |
| Sweden | 8 | 86 | 6 |
| UK | 8 | 88 | 4 |
| **EU15** | **10** | **85** | **6** |

*Note:* In the context of the Internet, have you ever heard of Internet trust marks? This question was asked to all respondents.

*Source:* European Commission, Special Eurobarometer survey on *European Union public opinion on issues relating to business to consumer e-commerce* (Reference: 201 EB60.0), March 2004.

### *Improving merchant Web sites*

An important step for further online payment uptake is to ensure merchants apply adequate security protection measures and invest to enhance security. These initiatives do not necessarily have to come from the public sector. For example Visa and MasterCard have established standards to prevent fraud in online payment via credit cards. The Visa Account Information Security (AIS) and MasterCard's SDP programmes have been specifically developed to improve data security against risk of unauthorised interception of financial information.[52] Such steps are designed to ensure greater security for online sales.

### *Tax issues*

Issues arising with regards to consumption taxation of cross-border electronic commerce have been addressed by the OECD. The 1998 Ottawa Taxation Framework Condition provides that consumption taxation of cross-border electronic commerce should result in taxation in the jurisdiction where the consumption takes place This, whilst preserving tax neutrality, raises practical difficulties in ensuring collection of consumption taxes on cross-border business-to-consumer transactions of electronic services and intangible products (OECD, 2001 and 2003c). Collecting consumption taxes directly from the consumer is not efficient given the administrative difficulties. For cross-border supplies of goods (a far greater trade than for services and intangibles,) the problems are much reduced as Customs administrations are able to ensure collection of any consumption tax due on line, before releasing the goods to the customer.

The European Union implemented a VAT Directive in July 2003, removing tax on exports of electronic services from the EU and, at the same time, requiring collection of VAT on electronic services imported into the EU by consumers from suppliers outside. In order to facilitate collection of VAT on these imports the EU followed a recommendation in a 2001 OECD report by allowing overseas suppliers to use a simplified on-line system of registration, reporting and payment. Unaccounted (*i.e.* untraceable/anonymous) payment systems could pose even greater problems for tax administrations.

***Education and Internet experience***

To improve the functioning of online transactions, it is important to raise consumer understanding, and awareness of their roles in ensuring that transactions are not unnecessarily vulnerable to misuse. Governments have taken a wide variety of initiatives to increase their use of the Internet for interactions and transactions mainly because of efficiency considerations, and many of these initiatives have the secondary aim of increasing spillovers of Internet familiarity and good practice. For example, providing possibilities to use electronic payment systems, *e.g.* for tax and other payments, reflects in part government commitment to improve awareness of payment systems and pull-through effects on businesses to provide efficient and secure payment means (OECD 2004e, and Annex 1). There are also initiatives such as providing detailed information on payment transactions by industry associations, *e.g.* documentation provided by the Federal German Banking Association (BdB, 2004). Internet experience more generally has positive impacts on the uptake of online payment methods (see Kallio et al., 2003).[53]

**Measuring online payments**

Online payments have only recently received attention for their importance in the development of e-business and e-commerce. There is rather little official statistical information on them especially for cross-country comparisons and time series analysis to better identify uptake of different kinds of payment systems, impediments and related issues. Comparable household and enterprise surveys are now carried out regularly in some countries (*e.g.* the Eurostat model surveys undertaken in EU countries, although the question on whether the individual or business made a payment on-line has been removed from the Eurostat and OECD household model surveys and OECD has removed the question from the business model survey, but whether a mobile phone has been used to make a payment has been added). There are some questions regarding perceptions of barriers to payment and security concerns, and these could usefully be extended to help analyse the drivers and impediments to the use of on line payment systems (for a first overview of measuring on line trust issues see OECD, 2005b). Related initiatives investigating payment systems, for example, the Electronic Payment Systems Observatory, have provided a useful information-sharing infrastructure on electronic payments (Carat, 2002). Initiatives that analyse individual payment systems (Krueger, 2004) are useful steps towards detailed analysis of online payment markets. More detailed information for OECD countries would allow a better understanding of differences and common challenges for online payments.

# ANNEX 1
# GOVERNMENT INITIATIVES RELATED TO ELECTRONIC PAYMENTS AND SETTLEMENT

| | |
|---|---|
| **Austria** | E-Payment modules for income taxes and e-government transactions, online banking, using XML standard and electronic signatures. |
| **Australia** | Australian businesses employing electronic payments. Other initiatives in place. |
| **Belgium** | Law governing electronic payments to instil trust among consumers and merchants. |
| **Czech Republic** | Electronic signature to enable communications with public administration. |
| **Finland** | Paperless accounting project for government agencies, with 70% participating by end 2004. Effort to standardise electronic invoices and payments with local and private sectors. |
| **France** | Basic security rules for safety of online payments and payment security observatory to monitor progress. |
| **Greece** | Legal framework for digital certificates and signatures. National certification scheme under development for electronic transactions. Banks, stock market and tax authorities implementing secure environments for transactions. |
| **Hungary** | Efforts to initiate electronic payments for business, but still requires changes in legal framework. |
| **Italy** | Initiative to automate payments in public administration. Implementation of access card for public services and payments. Italian banking association endorsing BANKPASS Web for secure online purchases and payments. |
| **Korea** | Expanding e-payment infrastructure in public and private transactions. Interoperability of payment card systems in public transportation. |
| **Mexico** | Bank of Mexico programme for secure electronic payment systems. Development of eSAT system for electronic transactions between companies and public authorities. |
| **The Netherlands** | Study of payment systems for internet and mobile phones and search for ways to accelerate development. |
| **New Zealand** | Act protecting electronic transactions. Strong presence of electronic banking. |
| **Poland** | Framework established for electronic payments and customs. |
| **Portugal** | e-Procurement seen as tool for development of electronic payments in setting example, building trust, stimulating private sector development, and laying legal groundwork. |
| **Sweden** | Ties into work on government procurement and electronic signatures. |
| **Switzerland** | Exchange of information for VAT calculation, but requires certified data. E-government transactions used to develop PKI and e-payment systems. |
| **Turkey** | Electronic signature law discussed. Articles regarding electronic contracts added to code of obligations. Banks conducting pilot projects. Electronic corporate document submission in development. |
| **United Kingdom** | Improving e-payment environment through pilot programmes, government use, trust building initiatives. |

*Source*: OECD. Summary responses to the *OECD Information Technology Outlook 2004* Policy Questionnaire: Electronic settlement / payments.

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## NOTES

1 US retail e-commerce sales have increased at around 25% annually since official data was first collected in 1999, with average growth of 32.6%. Fourth quarter 2005 adjusted retail e-commerce sales were up 23% year-on-year, to make up 2.4% of US retail sales and growth shows no signs of slackening. The lowest growth was in 2001 after the collapse of the dot.com boom (US Department of Commerce http://www.census.gov/mrts/www/mrts.html). Total e-commerce sales for 2005 were estimated at USD 86.3 billion. Note that travel services, financial brokers and dealers, and ticket sales agencies are **not** included in either the total retail or retail e-commerce sales. Private sector estimates (based on wider definitions) showed similar results. For example the Shop.org annual retailing study of 150 retailers projected 2004 online sales (including travel) to grow 27% over 2003 to USD 144 billion (Forrester Research and Shop.org, 2004).

2 According to the American Customer Satisfaction Index (ACSI), in the fourth quarter of 2004 online retailers had a score for e-commerce of 80.8 out of 100, a rise of 4% over the same period in 2003.

3 See OECD (2004c and 2004f) for a detailed discussion of the digital music and games industries.

4 For a detailed survey of online and mobile payments see the Survey of Developments in Electronic Money and Internet and Mobile Payments, Bank for International Settlements (BIS, 2004).

5 High levels of Internet penetration have led to rapid adoption of Internet banking and associated online payments. In 2002 there were over 4 million e-banking customers in a population of below 9 million. Some banks provide access to digital marketplaces in connection with their Internet services (BIS, 2004).

6 Almost all banking services are available via the Internet, and Internet-based transactions are around 25% of all credit transactions (BIS, 2004).

7 In 2002 Internet-based business-to-consumer transactions were JPY 1.6 trillion. Most e-commerce payments still use methods such as credit transfers through ATMs and cash on delivery.

8 For example, in January 2003 Paybox discontinued services in the UK, Sweden and Germany due to slow development of the mobile payment market (Paybox, 2003a). At the same time it expanded in other countries, signing a licence agreement with M-Net KSCC, a Kuwaiti Consortium for Automated Banking Service, to implement mobile payment services in 10 Middle East countries (Paybox, 2003b).

9 Results based on an analysis of more than 500 Web sites across EU Member States. Given the small sample size and selection of Web sites, the data for individual countries should be treated as indicative only.

10 For further details on the survey see Box 2 below.

11 Alternative payment methods such as mobile payments (*e.g.* using pre-paid cards) could enable this segment of the population to purchase digital content. Credit card brands have also introduced pre-paid cards; and this alternative payment tool may supply hitherto un-serviced customers and/or markets.

12 The survey defines a "failed credit" card transaction as "any transaction in which the shopper has entered credit card number, card verification number (CVV2/CVC2), credit cardholder's name and expiry date, but which does not lead to payment of the purchase transaction because it is aborted for any reason".

13 The Finnish credit card service company Luottokunta instructed consumers not to give credit card numbers in Internet transactions and wait for more secure payment services (Kallio et al. 2003).

14 SET makes use of public key cryptography to authenticate buyer and seller and the confidentiality of buyer payment information is maintained. However, for a number of reasons including complexity and large investment requirements, this system has failed to gain widespread acceptance.

15 According to Visa, payment cancelling is 15-20 times more frequent in online than in offline payment, with 80% of cancellation being related to customer denial of authorisation.

16 For further detail see also: http://www.citibank.com/us/cards.

17 The Click & Buy Alliance is developed by Webpay International AG (http://www.webpay-international.com/index.html), a commerce platform provider.

18 Bankpass Web is an electronic wallet promoted within the Italian Banking Association. It allows use of different Internet payment instruments (bank debit and credit cards). The user communicates to the bank the data of preferred payment instruments. The bank provides an identification code and password.

19 Inter Debit (Japan Internet Promotion Association – 183 institutions including 94 financial institutions launched 2003) and Net Debit (launched 2000, commercial banks), have real-time debit transfer schemes. The consumer obtains authorisation by inputting information preregistered with the bank, such as customer ID codes and passwords, and the account is debited immediately.

20 For example, the online media seller Musicbrigade offers the possibility of payment with PayPal.

21 For example, the United States v. Teresa Smith is a case where repeated fraud was possible by use of different identities. Also, PayPal payments that verified the seller still led to significant customer fraud *e.g.* Commonwealth of Virginia v. Matthew William Tynan (National White Collar Crime Center, 2002).

22 Paybox was founded in 1999, and is owned by Deutsche Bank AG and Debitel AG.

23 The consumer receives a card of up to EUR 600 value and via a digital code can use this for online purchases.

24 Moneta Online is a scheme issued by a major Italian bank. It provides a scratch card (up to EUR 250), which can be used at merchants subscribing to the MONETA and Visa circuits. When paying, the user connects to the Moneta online Web site and gets a temporary, disposable virtual Visa card to be used in the payment transaction on the merchant Web site. CartaFacile is an anonymous prepaid instrument issued by a bank that sets up and operates an account related to a card number; funds are available via a PIN code.

25 Paysafecard is a multifunction Internet payment system operated by paysafecard.com Weltkarten AG. It is based on a prepaid scratch card similar to a telephone card, and is totally anonymous and fully transferable.

26 Results from an open online-survey, based on 13 186 replies collected from March-May 2004. The survey emphasised that there is an over-representation of men, and young, well-educated and technology-using people, but that this may be an advantage in indicating attitudes of early movers and emerging trends.

27 In October 2004, more than 14 million US people from 12 upwards had purchased digital content for less than USD 2 in the prior year, an increase of over 10 million since October 2003 (Peppercoin, 2004).

28 A 2004 German market study by Fittkau & Maaß found that more than half of Internet users are willing to pay for digital Internet content, a considerable increase from 2000 (quoted in Brandstetter, 2004).

29 In Denmark, PBS provides three micropayment systems: *i)* Valus, *ii)* EWire, *iii)* CoinClick. Internet merchants make an agreement with one of micropayment operators. A customer pays a relatively small amount in advance to the operator using ordinary payment solutions such as credit or debit cards.

30 Paysafecard is a prepaid payment service that can be used for micropayments. Card values are between EUR 25-100 and contain a 16-digit PIN.

31 Timothy Lee, Vice President for E-Commerce, Visa International, telephone interview 24 January 2005.

32 In the German market some 60 providers are no longer operating and the three big providers, T-Pay, FIRSTGATE and Webcents, are taking market share (Brandstetter, 2004).

33 Mobile penetration and use in different markets will also be an important factor in relative uptake.

34 For example the Belgian Ogone provides a secure electronic payments Internet platform for sales applications and Web sites of electronic commerce shops. The German-based Pago offers similar services.

35 In a SET transaction the customer, retailer and bank mutually prove their identity with digital certificates and digital signatures and all security-relevant transaction data are secured by encryption. The merchant does not receive any financial information and the bank does not receive any on the purchase or the seller.

36 AllCharge provides services to online digital content merchants including micropayments, and an ASP model with outsourced pricing, billing and payment that allows rapid merchant start-up. The system supports all payment methods -- smart cards, prepaid cards, credit cards, telecom and other monthly bills.

37 Platforms often treat one side as a profit centre and the other as a loss leader. Computer game platform providers treat hardware sales as loss leaders (they sell games platforms at a loss); profits come from royalties from game developers. In contrast, providers of operating system platforms for PCs do the opposite, and charge consumers appropriately for their platforms (Rochet and Tirole, 2001). Person-to-person payment providers must determine who to charge transaction fees, as revenues from float no longer provide the majority of their revenue.

38 Rysman's approach is to analyse whether consumers rely on one payment instrument or on several, in which case the potential for lock-in would be weaker. He finds that consumers concentrate their payment on a single payment network (single homing), but that a great number own a variety of unused cards that allow use of multiple networks (multi-homing). The level of multi-homing affects the market power a network has over merchants. Rysman established a positive and significant network correlation between merchant acceptance and consumer usage. This suggested there may be a positive feedback loop between consumer usage and merchant acceptance. It is unclear which effect dominates from the perspective of merchants, and if the merchant dropped a network affiliation this would lead to loss of consumer sales.

39 In a German survey 72.7% of consumers replied that greater unification of payment systems would make online payments easier (University of Karlsruhe in Brandstetter, 2004).

40 Companies such as PayPal or Citibank use the ACH, credit card and EFT network to provide electronic person-to-person payments. The clearing and settling of funds takes place over traditional payment networks. Further, in some services recipients do not need to join to receive funds *e.g.* Egg Pay.

41 Survey results for Germany indicate that banks have a considerable advantage in trust over other payment providers including credit card companies. Internet service providers and telecommunications companies are considerably behind both of these traditional payment providers (Krueger, 2004).

42 For example Isabel, the specialised business-to-business Internet payment service provider, is owned by the four largest Belgian banks (Fortis Bank, KBC, ING Belgium and Dexia). Banks have also shown interest in mobile payment solutions. An example is the Italian Omnipay Prepagato scheme developed by the telecommunications company, managed by a financial intermediary and issued by a bank. The user buys a telephone card and the telephone credit (provided it is still intact) can be converted into a bank credit.

43 Almost half (48%) of mediating service providers have been initiated by non-banks, but banks were involved in the other half, either directly (22%) or in partnerships (30%). These services have been positioned between bank and the merchant in areas where traditional banks are generally weak, such as integration into online-shopping (especially online auctions), or online person-to-person payments. All of the announced or piloted mediating service systems are offered by banks or mixed partners (Carat, 2002).

44 The rise in problems related to "phishing", spyware and malware has become a source of concern with regards to costs and ensuring consumer confidence in Internet security in general. See also OECD 2005b.

45 Less face-to-face contact decreases the level of trust. Moreover, the increase in the size of the market implies encounters with more firms. This potentially means fewer repeated interactions, fewer face-to-face, and a lower probability that members of the same community interact with the same firms. Greater mobility decreases the strength of traditional networks whose members transmit information from one to another and over time (Ben-Ner and Putterman, 2002; Isaac and Walker, 1998).

46 The customer is asked via e-mail to get in contact with the customer's bank. If the customer follows this link, they will not get to the bank Web page but to a faked Web site. In this way it is hoped to get confidential information such as passwords and other financial information.

47 http://www.mobilepaymentforum.org.

48 For further information see: http://www.antiphishing.org/index.html

49 As part of the eEurope 2005 action plan, the e-Money Licensed Issuer (EMLI) directive was drafted and implemented as in 2002. The requirements are less strong than those for acquiring a full banking license and also have certain restrictions, *e.g.* in terms of credit issuance.

50 Princeton Associates (2002) found no evidence that a Web site's possession and display of awards and certificates significantly increased consumer confidence. They found that only 9% of those surveyed saw this of importance whereas more than half found the display of awards of no significance. This does not mean that certificates and awards are of no help to provide stronger consumer confidence.

51 In December 2001, as part of the e-confidence strategy, the EU began to develop a European trust mark scheme, elaborated by UNICE (Union of Industrial and Employer Confederations of Europe) and BEUC (European Consumers Organisation). This initiative to establish a single trust mark was designed to facilitate consumer recognition, associate good business practice principles, as well as mechanisms to ensure that those principles are applied in practice by companies subscribing to the trust mark.

52 These programmes are largely setting worldwide minimum standards for security certification particularly for MasterCard. For Visa different regional requirements apply. Merchants are required certification that security measures are in accordance with credit card organisation requirements. Since 2001 Visa merchants and Acquirers have an obligation to abide by these rules with no exception for smaller merchants. For MasterCard, requirements to obtain certification were to be adopted by 2005, however, adoption is obligatory only for merchants processing more than USD 125 000 and remains recommended for others. If security standards are not adopted merchants may face financial penalties and have card payment revoked. Required security standards as stipulated from Visa and MasterCard cover a range of domains such as the prescription of secure transmission of information, ensuring data security through efficient firewalls, to adopting the newest security software for firewalls (Visa, 2001a, b; MasterCard, 2003).

53 In Finland, regular Internet bill payment is well-established and most bank customers pay bills at least several times a month. As bank customers use electronic services for routine bill payment, they learn to use new payment technology and associated electronic services (Kallio et al. 2003).