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Digital economy and structural change

E-payments: modern complement to traditional payment systems

- In **electronic commerce, the challenges of payment transactions were initially underestimated**. Business via the internet and mobile telephony has so far been dominated by the methods of payment customary in traditional business. However, in light of advances in e-commerce, traditional business models are increasingly coming up against their limits.
- Secure, user-friendly and low-priced **innovative payment solutions are urgently required to boost** internationally oriented **e-commerce**. Value-creating market players – from payment system providers, service providers, network operators and producers of terminals to financial institutions – pin great hopes on rapid progress with new payment systems.
- Security is a key criterion for electronic payment systems. **Critical issues are authorisation, authentication, privacy, integrity, theft and data corruption**. The possibility of unauthorised access by third parties, misuse and manipulation must be excluded. It has to be ensured that information on the volume, execution date and purpose of a transaction is consistent.
- Sellers are reluctant to invest in the infrastructure of payment systems which are so far used by only a small number of buyers. Only a few buyers choose solutions used by just a small number of sellers. **Only a system which far exceeds the critical mass** and spreads rapidly in the short run **has a chance of succeeding in the market in the long term**.
- On a short-term horizon, micro-payments offer good opportunities for innovative payment schemes. Mobile payment systems can be regarded as the most promising solutions; starting virtually from scratch, their market share will probably rise to 5% in Western Europe in the next five years. In view of the expansion of already established applications, however, the new schemes will decline in importance over the long term. **Fewer than three of today's more than 100 business models are likely to survive**.
- Electronic payment systems are becoming more attractive for large financial institutions. The systems already used in traditional offline business and which have been adapted to meet the new demands of e-business (**credit cards**, **debit cards** (especially in Germany) and **smart-card-based electronic wallets**) **have very good prospects** of convincing online customers.
- In the medium term **mobile payment systems will be an** even more **valuable channel** for e-business than internet-based systems. Nevertheless, the **innovative systems are likely to be pushed aside by upgraded traditional solutions** in the longer term.

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E-payments: modern complement to traditional payment systems

During the period of internet hype, leading private research institutes were predicting that e-business turnover would more than double annually up to 2005. But these exorbitant expectations were disappointed, as volumes developed at a far more moderate pace. One reason was that e-business pioneers tended to see product range, marketing and logistics as the likely problem areas, and initially underestimated the challenge of conducting downstream payment transactions. Accordingly, the 35 m online purchases already made in Europe have been dominated by payment methods also customary in offline business (credit cards, debit cards, direct debit, cash on delivery, invoicing, cash before delivery). Nonetheless, there is general agreement that traditional business models are increasingly coming up against their limits. If electronic media are to be used in cross-border trade, then secure, user-friendly and low-priced innovative payment solutions must be established very soon. While these online-enabled systems could emerge from solutions in use today in offline business, they could also develop from innovations tailored for e-business requirements.

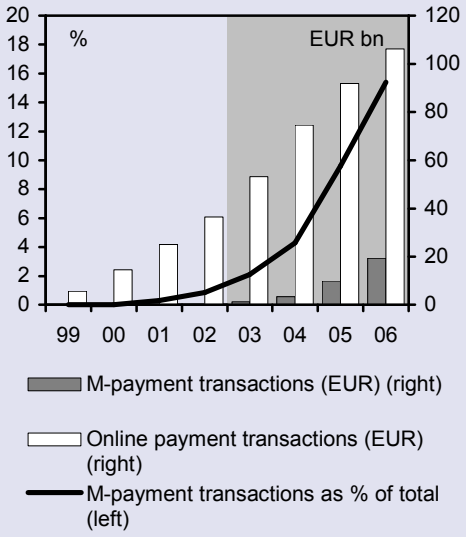
We will begin by focusing on the general characteristics of payment methods, and will discuss these considering systems currently in use as examples. This is followed by an examination of the demands which involved parties place upon payment systems. By comparing system characteristics with system demands, we can assess the prospects for electronic methods of payment.[1]

Symbiosis developing in online trade

Acceptance of electronic payment systems rises sharply when associated with sales of purely digitised content. But mobile phone or internet users will only accept paid content if it offers them real value-added. According to the Association of German Magazine Publishers (VDZ), 51% of internet users are basically prepared to pay for content, especially database access and adult multimedia products. Thanks to rapid transmission technologies like 3G and WLAN, mobile telephony is becoming an important business area, which is likely to achieve worldwide turnover of EUR 11 bn in 2005.[2] As early as 2001, European consumers spent some EUR 600 m on mobile content like ringtones and logos, and EUR 250 m on internet content. Sales of paid content will see a significant increase – e.g. in Germany, sales are set to rise tenfold between 2002 and 2005.

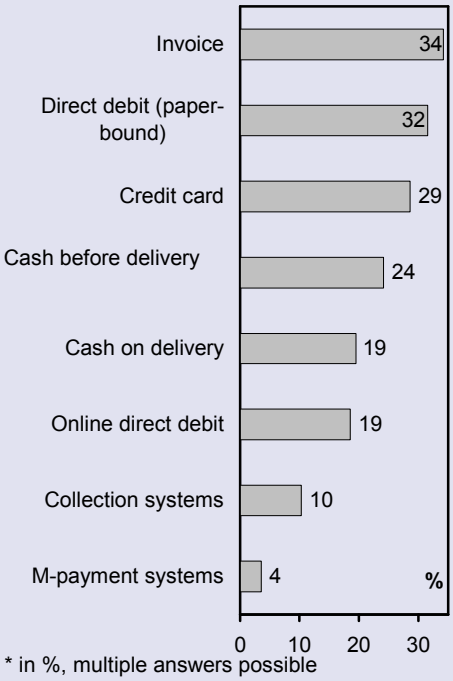
Currently, the transaction costs associated with collecting micro-payments (under EUR 10) which are charged for multimedia content are only recoverable using the micro-payment system, not credit cards. In view of the commissions and chargeback fees, the Stiftung Warentest consumer testing agency calculates that settling an account by credit card in Germany is only profitable for amounts from EUR 1.50 upward. This is one reason why customers of the Frankfurter Allgemeine Zeitung's online archive pay EUR 1.50 per article by electronic settlement, while a minimum amount of EUR 4 is set for credit card payment. Operators of innovative electronic payment systems are very interested in cooperating with high-profile

Mobile compared to online payment expenditure, Europe



Source: Frost&Sullivan, 2002

Consumers' preferred internet payment methods*, 2003



* in %, multiple answers possible

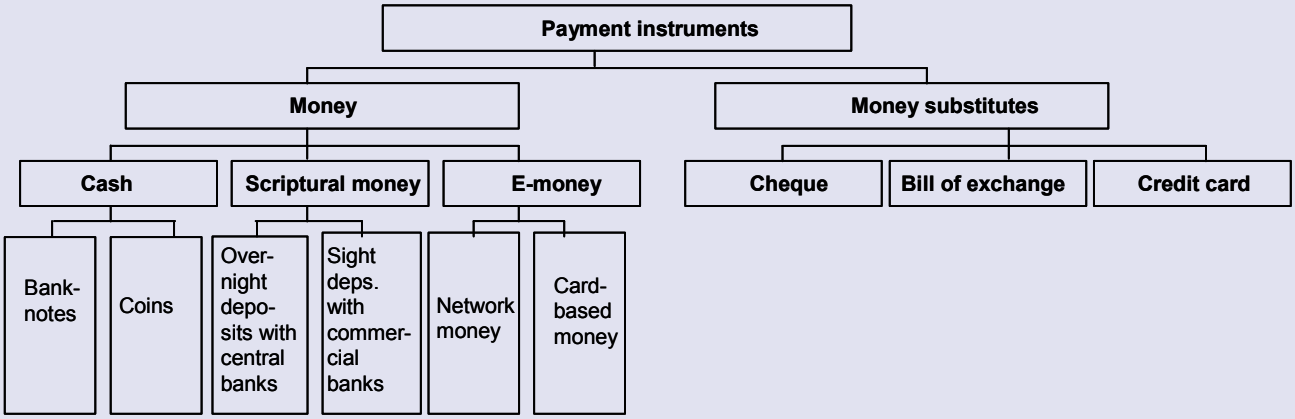
Source: Institute for Economic Policy and Economic Research, Karlsruhe University, 2003

[1] For a discussion of the implications for monetary policy see Kern, Steffen (2001): Electronic money – the payment instrument of the future? in: Deutsche Bank Research, E-conomics, No. 12, Frankfurt a. M.

[2] Heng, Stefan (2003): Mobile telephony – cooperation and value-added are key to further success, in: Deutsche Bank Research, E-conomics, No. 42, Frankfurt a. M.

content providers. They hope to boost their reputation and, in this way, win new customers.

Payment instruments: an overview



Source: Schiebeck, Hölscher, 1998

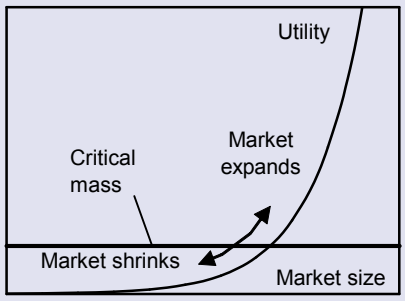
Payment systems need a successful launch

Sellers are hesitant about investing in an electronic payment infrastructure that only a few customers are, as yet, interested in using. At the same time, few buyers will opt for a system used by only a few merchants. This applies even to buyers who are normally very open to new technologies. Established payment systems – here we mean credit and debit cards, rather than invoicing or cash on delivery – have an advantage over innovative electronic payment systems as they are network goods which enjoy universal acceptance. A system's attractiveness rises proportionally faster than the number of people using it.[3] Only a product that far exceeds the critical mass, and is thus able to spread rapidly in the short term, has a chance of establishing itself in the market in the long term. One route toward this end is offered by two platforms that represent the entire value chain: Mobile Electronic Transactions (MeT) and the E-Commerce Expert Group (ECOMEG). It is crucial that tele-communications companies, content providers, and established banks in particular all play their part here. Financial institutions represent constancy and so have a head start in winning customer confidence, which aids the launch of any system.

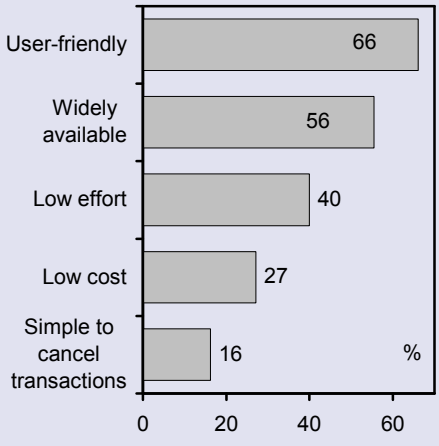
Spectrum of demands: squaring the circle

In order to establish a system of payment, its access and security technology has to offer solutions acceptable to all providers and users. This means demands on the system could diverge widely – or even contradict each other. For instance, the consumer has an interest in being able to cancel transactions. However, financial institutions and merchants want to rule this out as far as possible, in view of high chargeback fees and the chance that bad debts might arise.

Demand for a network good



Core criteria of preferred payment methods*



* in %, multiple answers possible

Source: Institute for Economic Policy and Economic Research, 2003

[3] The telephone as a network good clearly illustrates this effect: The more people own telephones, the more attractive it becomes for other individuals to acquire telephones, so they can receive and make calls.

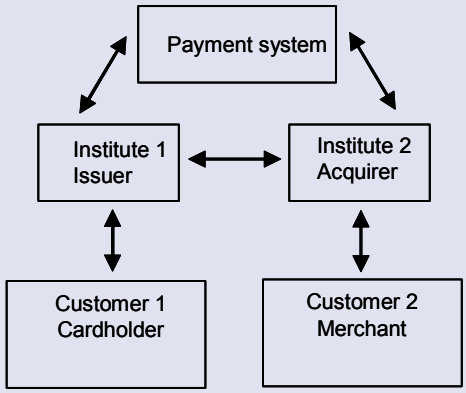
Moreover, merchants are always interested in customer profiling. This is the only way they can direct their marketing efforts with pinpoint accuracy. Despite security mechanisms, German customers in particular are very reluctant to divulge personal details on the internet. Only one in four consumers is prepared to give confidential data. Three out of five have never made an electronic purchase because of fear of data misuse in the anonymity of the internet.

The internet, as an open system, faces particular challenges when dealing with sensitive data. Security is a central criterion for electronic payment systems. In the foreground come questions of authorisation, authentication, privacy, integrity and data corruption. The possibility of unauthorised access by third parties, misuse and manipulation must be excluded. To avoid disputes over payment, it has to be ensured that consistency about the volume, execution date and purpose of a transaction is guaranteed.

Perceived security – the crucial factor!

(Perceived) security plays a crucial role. It is derived from, among other things, the level of security provided by the technology, together with how it is marketed. If the system can offer acceptable answers on issues of authorisation, authentication, privacy, integrity, procedure if value units are stolen, and procedures to deal with error transactions, then a high level of technological security will be the result. Authorisation means that legitimate users really are the only people who can use the system. Linked to this is authentication. This means ensuring that the partners to the transaction really are who they claim to be. The privacy criterion is fulfilled when the system allows only the actual participants to observe the transaction. Related to this is integrity. This is about protecting the information transmitted from being manipulated for unlawful purposes. In addition, procedures should be established for dealing with a reported theft of any carrier medium (e.g. laptop) upon which value units have been stored. Furthermore, electronic payment systems must be prepared for the possibility of accidental data corruption. It must be guaranteed that if a technical defect occurs, the transaction will not be completed from either side (totality). The customers need to know for sure that the agreed payment will reach the intended recipients, and that only successful transactions will be charged to their account.

Payment transaction system



Source: Ketterer, Stroborn, 2002

Demands on e-payment systems

General

- Security
- Consistency
- Totality

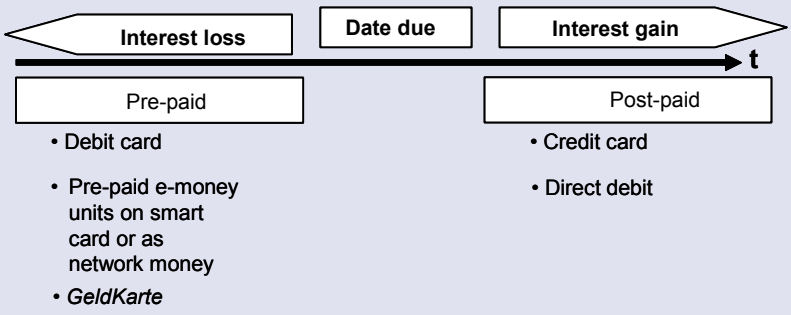
Special demands of customers

- Ease of use
- Anonymity
- Low cost
- Portability
- Widespread use among merchants

Special demands of merchants

- Indisputability
- Low transaction costs
- Widespread use among customers

Debit dates of various payment methods



Source: DB Research, 2004

User-friendly access opens doors

Apart from security, of course, access conditions are also crucial to winning acceptance. Fundamental to these are convenience and

ease of use. Special hardware and software system requirements, laborious registration processes, or menus that require long practice to navigate successfully can all hinder acceptance of a procedure. Special system requirements are a knockout criterion, purely because quite a lot of online purchases are made at work using an office computer to which the user has only limited administration rights. Moreover, convenience depends on transmission speeds and settlement procedures. The prospect of slow, unstable connections impedes acceptance. Ultimately, convenience demands a system that is flexible from a technological, economic and geographical perspective. Solutions capable of conducting both online and offline transactions, which can be used with different media (portability), are solutions with healthy prospects.

Vision: the mobile phone replaces the wallet

M-payment systems have a great advantage over internet-backed services in terms of access conditions, in that they are used in both online and offline transactions. Nevertheless, even m-payment services are subject to limitations, as they are connected via mobile phone, a medium unsuitable for higher-level security demands. Payment is authenticated via text message (SMS) or automated mobile call. Here, operators of mobile payment systems currently go by the evidence of the "normal course of events". In other words, the owner of the mobile handset is invariably also presumed to be the person who initiates the bank transaction. This principle is the subject of legal debate.

In the following, we use prominent solutions in demonstrating how these complex demands are applied in practice. Our comparison of credit, debit and smart cards with new electronic methods points to the market prospects of the innovative payment systems.

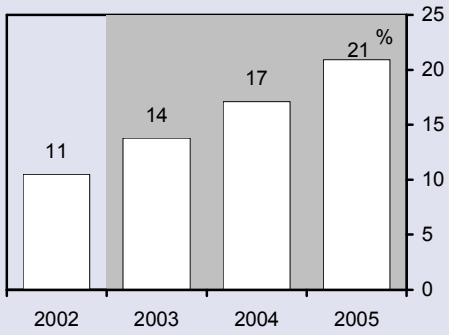
Credit card in new robes even more attractive

While the credit card, already in widespread use across the world, has its origins in offline business, it is also gaining ground as a method of making macro-payments in internationally oriented online business. Some consumers, however, still shrink from making online purchases by credit card. They fear that the card data needed to make a payment (name, number, expiry date) could fall into the wrong hands in the anonymity of the internet. This fear proves to have few roots in objective reality, since except in cases of gross negligence, the customer can claim compensation if his/her account is debited in error. The risk of fraud is thus less of a burden on cardholders than on merchants and credit-card companies. Moreover, additional electronic functions like Verified by Visa[4] make credit-card use even safer and thus further promote its attractiveness when making macro-payments.

Don't write off the *GeldKarte* too soon

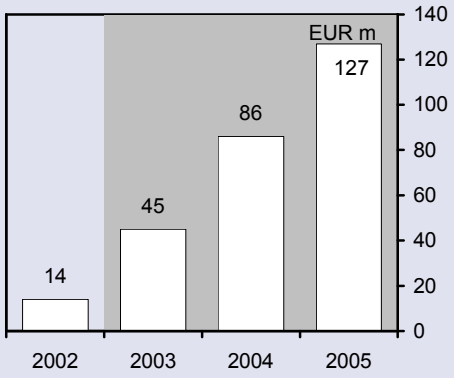
For micro-payments under EUR 10, using smart cards in online and offline transactions offers more interesting fee structures than credit cards. The smart card is available as an independent product, but also in combination with a debit card. It stores encoded value units on its chip. Because no information is transmitted other than the monetary amount, this type of electronic wallet allows payments to be made anonymously.

Demand for paid content, USA (in % of internet users)



Source: eMarketer, 2003

Sales of paid content, Germany



Source: Sapient, 2003

Credit card

Cost to the merchant: 3-5% of sales

Accepting outlets in Germany: 400,000

Users in Germany: 21 m

http://www.bdb.de

Source: DB Research, Dec. 2003

GeldKarte

Cost to the merchant: 0.3% of sales, min. EUR 0.01

Accepting outlets in Germany: 100,000 (7 of which are online)

Cards issued in Germany: 62 m

http://www.geldkarte.de

Source: DB Research, Dec. 2003

[4] The credit-card holder registers for *Verified by Visa* with the bank and receives a password. When making an online purchase, the credit-card number is given over the internet. After that, the password is submitted via the bank's own website.

The smart-card-based electronic wallet is known as *Proton* in Belgium, as *Avant* in Finland, as *Danmont* in Denmark, as *Chipknip* in the Netherlands, as *MEP* in Portugal, as *Minipay* in Italy, as *Minicash* in Luxembourg, as *Moneo* in France, as *Monedero 4B* in Spain and as *GeldKarte* in Germany. The *GeldKarte* has so far found only limited application in German e-business. To pay with this card, the user needs a card-reading device with specialised software. The card-reader costs EUR 60, a high price in relation to the actual value-added it provides. This has hindered its broader acceptance among private consumers to date. Accordingly, the 62 m *GeldKarte* in circulation in Germany in 2002 were used in barely 36 m transactions in online and offline trade. By contrast, the 21 m credit cards were used in 377 m transactions. Online suppliers offer this as the reason for their cautiousness about the *GeldKarte*. Another problem is that despite the high level of security surrounding the *GeldKarte*, only seven online shops currently accept it.

To limit the risk of losing the sum stored on the card, the German *GeldKarte*, in contrast to France's *Moneo*, does not provide an automatic credit-reloading function. So credit can only be uploaded at ATMs for the moment. In the future, though, a function for loading credit via the internet is to be added, which will significantly increase convenience and simultaneously guarantee a high level of security.

The *GeldKarte* is growing in attractiveness, not only because of its increased user-friendliness, but also due to technological progress and new legislation. Technological progress will bring a sustained lowering of the price of the card-reading device required, which will increase demand. In addition, a tightening of youth protection legislation will provide a big boost to *GeldKarte* circulation from 2007. New regulations demand that those conducting online and offline business differentiate between customers on the basis of age. The *GeldKarte* thus offers an elegant opportunity to prevent younger people from purchasing goods hazardous to youths, whether from vending machines or on the internet.

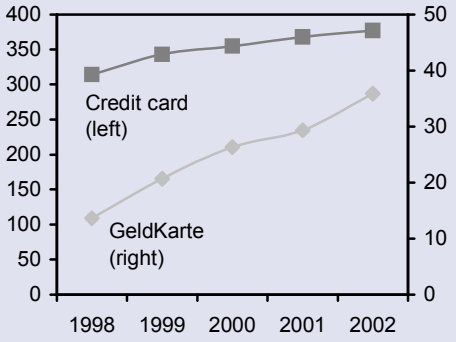
Digital signature creates legal certainty

Germany's Signature Law came in response to the new demands of e-business, and places on an equal footing the digital signature used on the internet and the handwritten signature used in traditional business situations. The digital signature is stored on a smart card and is used with the aid of a specialised card-reading device.[5] In this way, specialised security mechanisms largely protect the actual identities of both partners to a contract. The signature alliance formed in Germany among banks, businesses and government bodies will continue to drive forward this project, which is so crucial to electronic commerce.[6]

In view of the technological and legal aspects previously mentioned (improved user-friendliness, fall in hardware prices, tightening of youth protection legislation, digital signature law), once the current lull passes, *GeldKarte* usage should make up significant ground in the medium term, especially for micro-payments.

Credit card versus *GeldKarte*, Germany

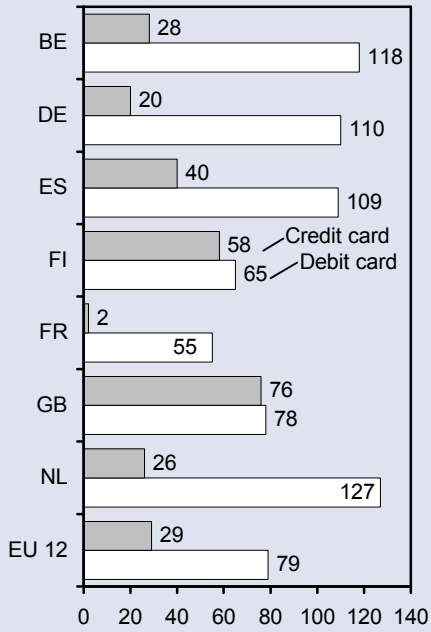
Transactions in m



Source: Association of German Banks, 2003

Credit versus debit card, 2000

per 100 inhabitants



Source: European Central Bank, 2000

[5] This reading device is the same one used with the *GeldKarte*.

[6] See Lamberti, Hermann-Josef and Matthias Büger (2004): Elektronische Signaturen machen etablierte Bezahlverfahren Internet-tauglich, in: Die Bank 3/2004, pp. 162-164.

Click&buy makes its mark in micro-payments

Up to now, the internet-based *Firstgate click&buy* in particular has worked very successfully in the area of micro-payments. Firstgate click&buy aggregates payments and debits the total sum from the buyer's bank account. Payment via *Firstgate click&buy* is made by inputting a user name and password. No personal data about the buyer is available to the seller, nor is further information about the actual transaction available to the system operator, which guarantees anonymity.

Firstgate click&buy

Cost to the merchant: 10-35% of sales

Accepting outlets in Germany: 2,500

Users in Germany: 2 m

http://www.firstgate.de

Source: DB Research, Dec. 2003

Telephone collection a qualified success

Infin-MicroPayment operates through fixed-rate telephone service lines and collects payment via the telephone bill. When customers call the service line, they receive a transaction number (TAN) for the intended payment. From the consumer's point of view, the advantage of telephone collection is that no personal data is transmitted across the internet, thus guaranteeing anonymity. The seller places particular value on the payment guarantee provided by the system operator. The downside of *infin-MicroPayment* is that the toll-paid service number (in Germany currently: 0190; in future: 0137 or 0900), when used for making micro-payments, attracts substantial additional telephone charges on top of the actual price of the purchase. Another disadvantage is that this procedure is suitable only for micro-payments, but not for macro-payments, as German law places an upper limit of EUR 30 on payments made through service lines. The charging limits, additional costs and dial-in procedure all cast doubt upon the ability of *infin-MicroPayment* to survive into the medium to long term.

Infin-MicroPayment

Cost to the merchant : 15-35% of sales

Accepting outlets in Germany: < 50

Users in Germany: n.a.

http://www.infin-online.de

Source: DB Research, Dec. 2003

Moxmo: medium-term alternative

In contrast to internet-based payment methods like *Firstgate click&buy* and *infin-MicroPayment*, *Moxmo* offers a mobile-phone-based method. To guarantee anonymity, *Moxmo* keeps transmission of payment data separate from the actual ordering process. Accordingly, during the payment process the buyer only gives the seller a mobile phone number (or, in a procedure offering greater anonymity, a specially assigned dummy number). The seller forwards to *Moxmo* the instruction to pay. *Moxmo* calls the buyer, verifies the relevant information (identity, amount), and collects the amount owed through direct debit. The advantage of *Moxmo* is the secure nature of the system, as sensitive data are never transmitted via the internet. But the system has a weak point: the high security levels guaranteed by the digital-signature method are not matched by *Moxmo's* underlying security procedures, which are based on mobile-phone technology.

Moxmo

Cost to the merchant: 3% of sales

Accepting outlets in Germany: 10

Users in Germany: approx. 1 m

http://www.moxmo.de

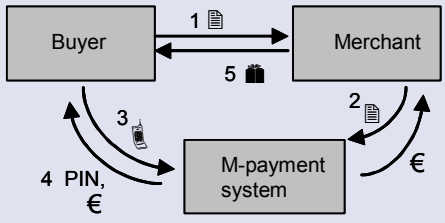
Source: DB Research, Dec. 2003

Established systems still hold the advantage

Economic, technological and legal challenges are making it increasingly obvious that solutions customary in traditional business are coming up against their limits when faced with electronic business transactions which take place in separate locations and at different times. System providers must quickly come up with convincing solutions suitable for the growing area of e-business. However, the demands of consumers and merchants often diverge widely, making this an extremely complex task.

Support from high-profile partners is crucial to the wider dissemination of new payment systems. A solution's success hinges on the questions of user-friendliness and perceived security. Here, content providers, suppliers of telecommunications infrastructure,

M-payment system



1 – 5: process sequence

: Order

: Delivery of goods

€ : Payment

: Inquiry by mobile phone

PIN: Personal identification number

Source: DB Research, 2004

and in particular banks, with their good reputation for conducting monetary transactions, have a duty to help lay the foundations for a successful launch. Suppliers of new products find it extremely difficult to make their mark against systems already established in the market. Small innovative system providers only have a real chance in niche markets, where big market players currently regard margins as insufficient. So the field of micro-payments will offer limited opportunities for innovative systems over the next five years.

The task of proving the buyer's identity on concluding a contract will in future bring the current business model of many innovative payment systems onto shaky ground. The mechanisms in current use cannot offer the degree of indisputability guaranteed by the digital signature. Although the mobile phone as everyday companion essentially constitutes an interesting alternative, doubts on the legal and technical sides will continue to restrict the long-term potential of m-payment systems. But thanks to advances in new rapid mobile-phone transmission technologies, mobile payment systems will achieve notable success in the short term. Their share in the total number of cashless transactions, which remains negligible in Western Europe, should grow to more than 5% over the next five years. After that, though, the figure will fall sharply and rapidly with the assimilation of up-and-coming new systems. Accordingly, consolidation is making massive strides in the still-young business area of electronic payment systems. Network effects mean even innovative payment systems that are fundamentally extremely user-friendly will be pushed out of the market. Fewer than three of today's more than 100 business models are likely to survive the next five years. On the other hand, systems already successful in offline business have excellent prospects. These include the internationally established credit card and, especially in Germany, the widely used debit card and smart card. The number of transactions made in Germany using the *GeldKarte* should increase by a factor of ten over the next five years.

Prospects for credit, debit and smart-card use in electronic commerce are improving, thanks to the establishment of new security mechanisms driven in Germany by the signature alliance. In addition, the major banks should start to take an interest very soon in micro-payments, currently a market niche. If payment systems already established today are expanded through substantial investments to meet the demands of e-business, they are likely to win over online customers straight away.

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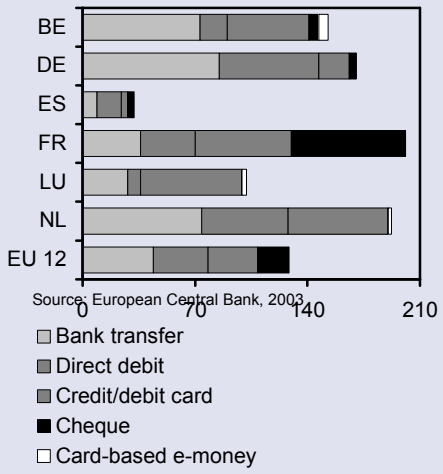
Exemplary Iberian cooperation

There has been much talk recently about the Spanish m-payment initiative *Mobipay*. This business model was agreed upon by Spain's major banks and telecommunications companies. The number of accepting outlets is about 54,000. Combining the different customer bases would make about 80% of the total Spanish population reachable.

As with *Moxmo*, the *Mobipay* customer gives the seller a mobile phone number. To simplify the procedure, this number can also be stuck to the phone as a barcode and scanned at the till. Once *Mobipay* receives notification, it sends a text message. The customer confirms this data using a personal identification number (PIN). The speed of the transmission technology means the entire transaction can be concluded online within 15 seconds.



Source: European Central Bank, 2003

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