Harry Leinonen

Payment habits and trends in the changing e-landscape 2010+

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The views expressed in this study are those of the author and do not necessarily reflect the views of the Bank of Finland.

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Abstract

Payment services are constantly developing. However, current payment methods have developed out of paper-based services during a period with severe limitations on ICT resources. These limitations have now almost entirely disappeared, and customers are interested in new forms of digitalised and integrated payment instruments. Within the payment industry, we can see a trend towards internationally standardised network-based services, as in several other similarly ICT-dependent industries.

This publication seeks to summarise current development trends, user demands, cost and pricing issues, technology and business trends as well as official views on payment developments. It endeavours to identify the most important factors affecting future payment habits for the period post-2010.

Based on the analysis, technological developments will support completely integrated electronic payments processed in real time. The mobile phone seems likely to become an important device for initiation and acceptance of payments. The information conveyed as part of a payment transaction will be extended to encompass all information necessary for further and later use (for example, ordering and invoicing data). However, the prevailing practice of widespread (cross-)subsidisation makes it hard for end-users to perceive the actual cost differences between alternative means of payment, thus delaying the adoption of more efficient payment habits. The current market structures also contain strong barriers to competition in the form of monopoly, oligopoly or service provider cooperation. Official measures by authorities to increase competition along the lines of modern policies for other network industries would speed up developments in payment services as well.

Keywords: payment services, electronic payments, payment trends, future payment instruments

JEL classification: G10, G18, F15, H4, L86, O33

Tiivistelmä

Maksujärjestelmät kehittyvät jatkuvasti. Nykyiset maksujärjestelmät ovat kuitenkin kehittyneet paperipohjaisten ratkaisujen pohjalta ja aikana, jolloin oli merkittäviä rajoituksia atk-resurssien käyttömahdollisuuksissa. Nämä rajoitukset ovat nyt kadonneet lähes täysin, ja asiakkaat ovat kiinnostuneita uusien täysin elektronisten ja integroitujen maksutapojen käyttämisestä. Maksujärjestelmissä on näkyvissä samanlainen kehitys kohti kansainvälisiä verkkopohjaisia palveluita kuin muilla vastaavilla atk-riippuvaisilla palvelualoilla.

Tässä julkaisussa pyritään antamaan kokonaiskuva nykyisistä kehitystrendeistä, asiakastoiveista, kustannus- ja hinnoittelunäkökulmista, tekniikan ja liiketoiminnan kehityksestä sekä maksupalvelujen kehitystä koskevista viranomaisten näkemyksistä. Tavoitteena on ollut selvittää keskeisimmät muutostekijät, jotka vaikuttavat tuleviin maksutapoihin ajankohtana 2010+.

Selvityksen mukaan tekniikan kehitys tulee tukemaan maksujen integroitua prosessointia täysin elektronisesti ja reaaliajassa. Matkapuhelimet tulevat olemaan keskeisessä asemassa maksujen lähettämisessä ja hyväksymisessä. Maksujen yhteydessä tullaan kuljettamaan kaikenlaista informaatiota, joka on tarpeellista maksujen jatkokäsittelyssä, kuten täydellisiä laskutus- ja tilaustietoja. Kehitystä hidastaa kuitenkin laajasti käytössä oleva (risti)subventointi, joka estää loppukäyttäjiä näkemästä eri maksutapojen todelliset kustannuserot. Nykyiset markkinarakenteet sisältävät myös merkittäviä kilpailun esteitä, kuten monopoleja, oligopoleja sekä liiallista toimittajayhteistyötä. Viranomaistoimenpiteillä kilpailun lisäämiseksi maksupalvelujen tarjonnassa voitaisiin nopeuttaa palvelujen kehitystä, jos noudatettaisiin moderneja linjauksia samaan tapaan kuin muilla verkkotoimialoilla.

Avainsanat: maksupalvelut, elektroniset maksut, maksutapojen kehittäminen, tulevaisuuden maksuvälineet

JEL-luokittelu: G10, G18, F15, H4, L86, O33

Foreword

Payment methods have developed throughout the history as a result of business and technological innovations. Over time, older ones are replaced by newer, more efficient ones. Payments are a daily necessity and the selection of a suitable payment method grows into individual payment habits. In order to catch a share of the market a new payment method has to find its way into customers' payment habits. As the demand for payments is determined by external factors and is fairly fixed, the new instrument needs to crowd out some of the use of an old instrument. Customers need to have a reason for changing their payment habits. Incentives for changes are generally lower cost, improved service and higher convenience compared to the old means of paying.

Currently there seem to be a large number of developments, which will have an impact on payment instruments. The business environment is becoming increasingly international and the SEPA undertaking will harmonise payment services in Europe, both via market developments and common regulations such as the Payment Service Directive. Consolidation and outsourcing are two general business trends. The technology developments point towards increased digitalisation and real-time processing, at the same time as the ICT costs are continuing to decrease rapidly. Old limitations on storage and communication resources have disappeared. Therefore, there seems to be a need for change, both of business models and technology platforms for payments, in the coming years.

This book is the summary of a project undertaken in the Bank of Finland with the objective of discovering business and technological innovations, with which possibly new payment approaches could be introduced to the market and changes in future payment habits could be brought about. Payments habits have changed slowly in the past and therefore the time period selected for the study is 2010+, ranging to about 5–10 years beyond then. According to the findings we appear to be heading towards a new era in payment technology.

The aim of the publication is to provide fundamental information on payment instruments and payment habits. What are the current development trends? What have made customers change their payment habits? What kind of new technology is available and how would its implementation benefit us? The basic idea is that the development ahead of us could be made more rapid and more efficient by providing a general overview of the most important factors.

The project undertook several separate studies and surveys. The detail findings can found on the web-page of the project www.bof.fi/sc/payhabits2010. The Bank of Finland has this as a focus area of research and the web-site will be updated with new analysis and studies over the coming years.

The Helsinki School of Economics was commissioned to conduct research on customers' current payment habits, factors affecting change and views and future developments. We are indebted to Prof Tom Dahlberg, M Sc (econ) Eerika Keinonen and Dr Anssi Öörni for these studies. For the survey on SME payment habits, we must thank the Federation of Finnish Enterprises, Suomen Yrittäjät ry and especially Risto Suominen. For help with cash surveys, we are indebted to Mervi Arponen, Nordea, Sarianna Rautiainen and Pentti Ylikarjula,OKO Bank and Teemu Virolainen, Sampo Bank plc.

The bank representatives in the Steering Group for Finnish Payment Systems (MJO) provided important support for the project. The project team has interviewed and received comments from Finnish experts on payments, technology and regulatory issues. Some of them also gave presentations at the project seminars. The following persons contributed especially with their time and expertise to the Payment Habits project: Björn-Erik Pagels, Oy Ahlström Ab and FACT; Tapani Penttilä, Jyri Marviala and Harri Pennanen, Automatia Oy; Outi Haunio-Rudanko, Consumer Agency; Mikko Hyppönen, F-Secure; Matti Räisänen, Federation of Finnish Commerce; Kaija Erjanti, Markku Hirvonen, Kari Nihtilä and Timo Ylitalo, Federation of Finnish Financial Services; Kirsi Leivo and Rainer Lindberg, Finnish Competition Authority; Martti Luukko and Sinikka Turunen, The Finnish Consumers' Association; Heikki Ala-Seppälä, Kesko Corporation; Petri Carpén, Heikki Kapanen and Panu Laine, Luottokunta Oy; Peter Nyberg and Seppo Tanninen, Ministery of Finance; Liisa Kanniainen, Mobey Forum and Nordea; Raija Järvinen and Mika Pantzar, National Consumer Research Centre; Lauri Pesonen, Nokia and Venyon Oy; Markus Hautala, Pekka Järvinen, Olli Kähkönen, Jouni Lallukka, Erkki Poutiainen and Vesa Riihimäki, Nordea; Petri Aalto, Kyllikki Pankakoski and Anne-Mari Tyrkkö, OKO Bank; Antti Punkari and Harri Rantanen, OpusCapita Oy; Tapio Aaltonen and Markku Alava, Population Register Centre; Jari Annala, S-group; Heikki Sirve, Samlink; Arto Rissanen and Veikko Virtanen, Sampo Bank plc; Paula Lampinen, Finnish Tax Administration; and Bo Harald, Tietoenator. Thanks to all those who have helped with this project and also those unmentioned international and domestic payment system forerunners who have over the years and on various

occasions increased our understanding of the complex structures and interesting perspectives on the future of payment systems.

The Bank of Finland project team constituted of Kari Kemppainen, Harry Leinonen and Kari Takala. Päivi Heikkinen, Emilia Koivuniemi and Kari Korhonen have been helpful with comments during the different stages of the project. The summary was written by Harry Leinonen, adviser to the board of the Bank of Finland. Heikki Koskenkylä, Mauri Lehtinen, Juha Tarkka and Kimmo Virolainen constituted the editorial board. The internal Payment Development Group within the Bank of Finland, constituted of vice governor Matti Louekoski, board member Pentti Hakkarainen, Kari Korhonen, Heikki Koskenkylä, Mauri Lehtinen, Harry Leinonen, Pentti Pikkarainen and Armi Westin, functioned as the steering group for the project. Nina Björklund, Pirjo Föhr-Tolvanen, Iris Kolehmainen, Teresa Magi, Pauliina Murto, Päivi Nietosvaara, Maija Salmela, Kati Salminen, Sinikka Sandholm and Petri Uusitalo have been responsible for the technical preparation of the publication. The English language revision and editing was done by Brian Fleming, Glen Harma and Louise Park-Ahonen.

The Bank of Finland wishes to thank everyone who contributed to the contents of the project and this book. I hope that this book will facilitate the development of the next generation of efficient and global payment methods.

Helsinki, December 2007
Matti Louekoski

Contents

Executive summary

Current payment systems have developed over a long period of time. However, as in all other industries, payments have recently been experiencing a faster pace of development since the introduction of electronic services. This will probably result in major changes in payment services during the 2010s.

Payments are basically fund transfer services. The end result of all the different means of payment is that the payer's account is debited and the payee's account credited. This is also true for modern cash payments, as payers withdraw cash from ATMs and shops deposit it directly in their bank accounts. The present process of development means that we can expect to see improvements in five different areas: payments will become

– faster,
– cheaper,
– more secure,
– easier to send and receive (interface efficiency) and
– better integrated to customer systems and processes.

Payment instruments appear to be heading towards a synthesis. The current differences between instruments will disappear when we move to real-time payment processing and to a real-time economy in general, with everybody connected all the time to rapid and low-cost network services. There will no longer be any need to differentiate technically between different payment instruments, as a credit transfer type of solution accompanied by a payment proposal message can efficiently replace all existing instruments. However, the possibility for branding and different contractual arrangements will still remain.

There are at present six clearly visible statistical trends in the EU area:

– non-cash payments are replacing cash payments
– electronic payments are replacing paper-based payments
– self-service is replacing branch banking
– use of ATMs is decreasing as card purchase volumes increase
– use of debit cards has grown faster than use of credit cards, but this may change
– direct debits are developing slowly.

Payment habits are, however, very different in different EU countries, and it will take many years to move to a more harmonised payment culture.

There is very little information available on the total costs of different payment instruments, which would include the costs for payers, payers' banks, payees, payees' banks and interbank infrastructures. We do not know the total costs. Cost differences have little impact on the use of different instruments. This, combined with non-transparent and cross-subsidised pricing, gives in most cases completely wrong price signals to end users. The volumes are therefore biased, which distorts even further the cost situation. More transparent pricing is needed to speed up developments towards more efficient payment habits.

Customers are slow to change their payment habits and need several clear incentives in order to do so. Based on past experience, the average penetration time from start to maturity for a new technical feature such as introducing ATMs or e-banking seems to be about ten years. According to customer survey findings, consumers will react to price differences. The main development needs appear to be in the area of customer interfaces, like e-and m-banking, and integration, eg e-invoicing support and increased data content. Users could also be more involved in the development of payment services.

ICT developments will have a major impact on payments processing. The cost of data storage, processing and telecommunication will continue to decrease rapidly, being basically halved every 18–24 months (Moore's law). New near-field communication methods such as Radio Frequency Identification (RFID) technology will provide completely new interfacing possibilities, and the bandwidth of long distance wireless communications will be sufficient at low cost for any payment service needs. Many factors point towards mobile (smart)phones becoming our main payment instrument during the 2010s, but this will require good security, addressing and data content standards. The main problem will be to coordinate the different new technical solutions into a new holistic overall design encompassing all stakeholders.

There are several new and important service developments currently under consideration or in the process of being implemented. A basic requirement for efficient development of current services is common global payment standards. E-payments need to become as standardised and easy to use as e-mails. E-invoicing will completely change invoicing and payment processes and will be the source of very considerable benefits for customers due to the automation of administrative processes. Banks are in a relationship of trust relative

to the users of their services, and the World Wide Web community and e/m-commerce will require trustworthy customer identification and payment/delivery guarantee services. The mobile handset has all the features necessary for becoming the physical payment instrument of the future and can deliver new integrated services such as e-ticketing. Providing mobile payment services will require good cooperation between all stakeholders: banks, telecommunication providers, handset producers and customers. The rapid growth of electronic payments will mean that paper cash will lose its position as a common means of payment. In an electronic world, public electronic cash, if needed, would only provide a standardised interface between liquidity accounts, as all payments will be bookable directly with finality over the networks. The present rapid technological development will most probably have a major impact on payment services in the 2010s, although customers tend to change their payment habits quite slowly.

Several indicators point towards radical changes in the market for payment services. New entrants like PayPal, telecommunications and other service providers are steadily increasing their market shares in e/m-payments without the traditional payment industry putting up competing projects or services. The infrastructure for payment transfers will become network-based using Internet technology and will use the general message processing services used by all other industries. The time will soon come to close down specific payment-related centres, as everything needed will be contained on the network servers of payment account service providers. How future-proof are the current SEPA developments? Who will run payment services in the future?

Authorities have played an important role in establishing current payment habits, and this will probably be the case for future changes as well. Authorities will have to cope with increased globalisation and higher levels of integration and complexity, with more interdependencies between service providers and systems. We will need much greater cooperation between authorities. It seems clear that the industry is facing major structural and technological changes, and increased official involvement appears essential in order to speed up developments and control possible negative side effects. In order to increase competition in network-based industries, authorities have introduced new types of regulations and measures to foster competition. In general, the major changes currently foreseen will require authorities to update both their policies and their regulations in order to meet future needs.

The project presented here has identified the following steps as being the most conducive to speeding up developments and making future payment systems and habits more efficient.

1) Developing an open, modular and general process-to-process dialogue and one common global message standard for all payment types with the ability to attach the necessary amount of data directly or as separate enclosures.

2) Designing an easy-to-use payment interface for mobile telephones including consumer-to-point-of-sale, consumer-to-vending-machine, consumer-to-ticketing-machine and consumer-to-consumer functions.

3) Developing a general customer identification and data encryption service for use in open network environments.

4) Defining standards for e-ordering and e-invoicing.

5) Introducing transparent end-user pricing, and abolishing different kinds of hidden pricing conventions and cross-subsidisation.

6) Analysing which competition-increasing solutions are needed in the payment industry.

7) Increasing customer involvement in payment service developments in order to further efficient integration.

8) Developing interbank clearing and settlement conventions suitable for a real-time and transaction-based network environment with immediate transportation and settlement.

9) Analysing the benefits of developing the new completely digitalised real-time network-based payment convention without the legacy burdens of current offerings.

Current payment services are resource-consuming compared with what the best practice could achieve. A common project taking a long-term overview of the need for coordinated efforts could considerably reduce the costs of paying. This would be in the interest of end-users, as they will always be paying the costs, either transparently or non-transparently.

Payment services appear to be on the verge of a new electronic era involving major changes. Will we have the same type of international consolidation for payments as for other electronised network industries? Who will be the payment service providers of the future? Will there be more competition in the market? How fast will customers change their payment habits? How can the changeover from the current situation to new digitalised instruments be made in the most efficient way?

More information on the Bank of Finland Payment Habits 2010 -project can be found on the project website at www.bof.fi/sc/payhabits2010.

1 Introduction

Payment services and infrastructures are facing major changes in the years ahead. The harmonisation and standardisation of European payment services via the SEPA (Single Euro Payments Area) initiative, developments in ICT and payment technology, standardisation and changes in user habits and banking strategies will all mean a considerable reshaping of the payment methods in use from 2010 onwards. Until now, national payment systems and habits have developed quite independently in the different countries of Europe. However, in future we can anticipate more common, pan-European or even international developments within payment services.

Within the Bank of Finland, a special project called Payment Habits 2010+ was set up in order study these development trends, assess the impact of the coming changes and establish the need for authority involvement to support and accelerate desired developments. It was obvious that developments in Finnish payment services will in future be much more dependent than before on international developments. The project considered general developments in payments services, especially in a period of five to ten years after 2010. There was a clear focus on SEPA developments, as Finland belongs to the area covered by this initiative. The study covered all major current payment methods, ie cash, credit transfers, direct debits and card payments, as well as new developments, eg Internet and mobile payments. The goal of the project was to identify important development trends and needs in order to bring them forward for discussion among stakeholders and decision-makers. The efficiency of payment systems has implications for the efficiency of the economy as a whole.

During the project, in-depth interviews were conducted with the major Finnish banks, the Finnish Bankers' Association, telecommunications service providers, IT centres, mobile telephone providers and service companies, and with enterprise, merchant and consumer organisations. The project reviewed a large number of reports and publications on payment system developments, and especially SEPA-related progress. Three separate Finnish market studies were conducted. One was a survey of private customers regarding their current usage of payment services and their views on development needs, another looked at small and medium-sized enterprises in relation to current services and future developments, while the last one dealt specifically with people making larger cash

withdrawals from bank branches, in order to identify changes in cash usage in Finland.

This report presents a summary of the project's findings. We seek to present in condensed form the current situation and development trends in payment services, the basic structures found in payment processing, customers' development expectations, the probable impact of ICT developments, the opportunities for and effects of authority involvement as well as probable market developments. The viewpoint has been both Finnish and European, with cross-country comparisons and a search for general development and harmonisation benefits. The project also presented a list of recommendations with the aim of facilitating efficient management of payment developments and the process of change towards more efficient payment services and habits in the economy.

A number of detailed studies produced by the project are also available. Based on the received feedback, the project will continue in different forms, eg seminars and new, related studies. Information on these can be found on the project website at www.bof.fi/sc/payhabits2010.

This report is structured as follows:

Chapter 2 presents different payment processes and their general developments. What is the essence of the payment process? Why do we need different types of payment processes? What have been the driving forces behind developments?

Chapter 3 describes the development of specific payment instruments, their process structures and usage characteristics.

Chapter 4 provides a statistical analysis of payment services, focusing on the EU15. What kinds of statistical trends can be found? What kinds of differences are there in national payment habits?

Chapter 5 analyses cost structures. What are the cost differences between different payment methods? What is the relationship between production costs and user benefits in advanced payment services?

Chapter 6 studies the impact of pricing schemes. How do pricing structures affect user choice? What is the impact of interchange fees?

Chapter 7 summarises the findings on user expectations regarding payment developments. What kind of future services are users expecting? How important are payment automation and electronic user interfaces?

Chapter 8 presents expected technological developments. What impact will the continuous growth in computer power and simultaneous decrease in ICT costs have on payment services? How will Internet and mobile technology be integrated into payments? What kind of re-engineering is necessary in order to enhance payment process efficiency?

Chapter 9 present views on payment service developments. How is customer service standardisation progressing? Is there a need for new products such as e-invoicing? What kind of Internet and mobile services are under development?

Chapter 10 analyses infrastructure and market developments. What are the SEPA deliverables proposed by the EPC (European Payments Council). What kind of infrastructure developments are in the pipeline? How may non-bank services affect the market?

Chapter 11 analyses the alternatives for authority involvement. What alternatives are there for authorities to support the development of payment services? What are the risks and benefits of authority actions? What will be the impact of the EU payments legislation and regulations currently being developed?

Chapter 12 presents conclusions and recommendations. How should developments be organised? How can the cost of change be minimised? How can we find a balance between short-term and long-term developments?

All chapters conclude with a summary of the issues analysed in that chapter and their potential impact on payment system developments and payment habits.

2 The development of payment processes

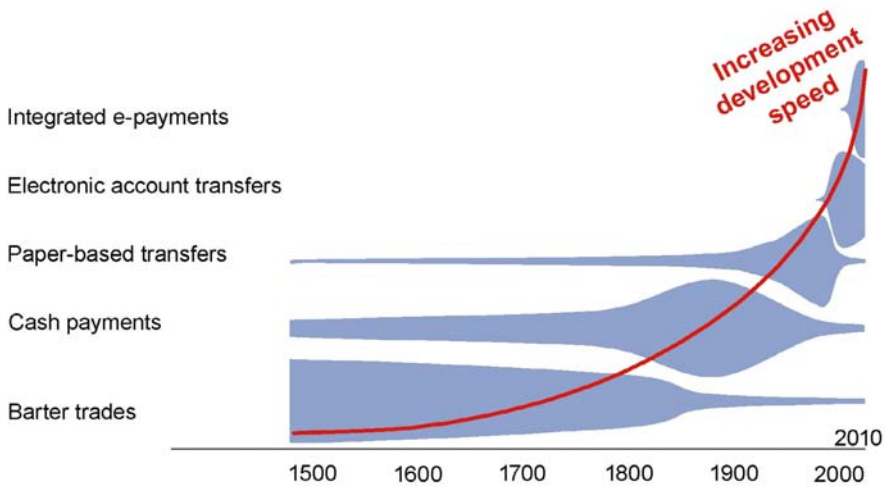
2.1 From barter to cash and onwards to account money and e-payment

Payments have developed rapidly during the past few decades, with the general thrust of developments following the general trends in society as a whole. However, payment developments seem generally to be somewhat slower than developments in other transportation services. Both users and service providers seem to be conservative in adapting new methods and conventions.

The development from barter to cash occurred over several centuries. The changeover from cash to account-based paper instruments has also been a long process, taking about one century, and is still in progress.[1] The most recent transformation from paper-based to electronic account transfers has been quite rapid, and in many countries the bulk of payments have been transformed in about two decades. We seem to be at the start of the next transformation process, in which e-payments will be integrated with the underlying commercial processes, ie payments will become an integrated part of the processes of ordering, delivery and invoicing. This integration process will, once again, probably be faster than earlier transformations and could already be almost completely accomplished before the end of the next decade. Against this background, it looks like the speed of payment developments is accelerating in line with the accelerated development experienced in other industries. The general development of dominant payment methods and their transformation over time is schematically presented in Figure 2.1.

[1] Pauli (2000), Kindleberger (1987), Born (1983).

Figure 2.1 **Experienced transformation of dominant payment methods over time**



Payments are a form of transportation service. The monetary value is transported from the payer to the payee. Generally the payee has provided some kind of service or good to the payer and the payer will in return hand over an agreed amount of monetary value. In barter and cash payments alike, a physical transportation of the return value is made.

In account-based systems the funds move from the payer's account to the payee's account within the books of institutions providing payment services. The payers and payees trust the system to make the correct bookings and keep their funds available for further payments. The need for physical transportation of cash has changed to transporting payment instructions for making the required bookings. The transport of paper-based instructions has generally been more efficient than the transporting of physical currency.

With the development of IC technology and the wide adoption of computers, networks, mobile telephones and other e-based solutions, the transportation methods for payments moved to a completely new level of efficiency. Initiation, transportation and bookings of payments can currently be made, at least in theory, immediately to anywhere in the world using modern e-payments, and in what is called straight-through-processing (STP) mode. Payments can be finalised without any manual or paper-based routines. This possibility will with a high degree of certainty become everyday reality post-2010.

Current e-payments still build on the old paper-based segregation of the payment process from the underlying commercial activity. However, there are newly emerging e-payment services that integrate the underlying commercial processes and payment processes, thereby creating considerable synergy benefits. This kind of integration can be seen in, for example, the modern e-invoicing processes provided by banks in some countries, combining ordering information and payments in e-commerce as well as combining ticketing and mobile payment services.

The development from barter to e-payments has step-by-step made payments and money more abstract. In barter you know and can generally see and feel what you get in return physically. In cash payment you receive physical notes and coins and trust that they can later be exchanged for something else of interest. In paper-based account payments you receive some kind of paper slip as proof that the specified amount will be transported from/to your account. In a completely e-based system you will just be able to see from a screen upon request that a given payment transaction has been executed and the funds transported to/from your account. Both money and payments have been transformed into a row of bits processed in a large network of numerous interconnected computers.

Every step in payment development has required the users to trust new devices and/or new institutions. Users have generally been cautious because of the values at stake, and in many cases not without reason. When moving from coins with metal values to notes, users asked if they could trust the written words of exchange on paper, and on several occasions in history the issuing banks have not been able to redeem their notes in full. For account money, users have to trust the deposit institutions and their systems/services, and bank runs have historically affected the trust in account money. Currently, many e-payment systems are provided by non-banks, and users need once again to extend their trust regarding both institutions and payment devices. Trust in payment services and system stability has proved so important to society that different kinds of regulatory means and institutional solutions such as central banks have been created in order to reduce customer risks and increase the stability of payment services.

What users have gained from these developments are efficiency and convenience. The costs of funds transportation services have decreased and the customer functions for initiating and receiving payments are more convenient, ie anytime from anywhere to anybody.

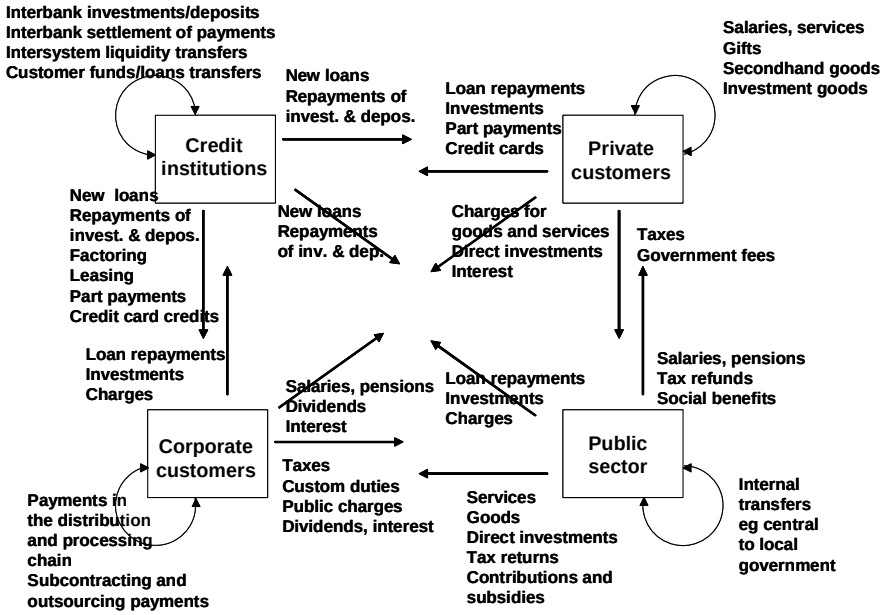
Internationally, the developments in payment technology have progressed quite unevenly. There are still a large number of cash-

based societies. Some countries are more paper-based, with, for example, a large amount of payments being made with cheques, while others have to a large extent moved over to paperless and e-based instruments. Payment systems seem generally to follow closely the general developments in the national economies. International standardisation and harmonisation is commonplace in other transportation industries and we are very likely to see this kind of development in the payment industry, too, in the years ahead.

2.2 Developments in payment flows

Modern society is completely dependent on the flow of payments, primarily in the form of transfers between the accounts of credit institutions. The main payment flows can be described in a four-box model involving companies, consumers, the public sector and credit institutions (Figure 2.2).

Figure 2.2 **The payment flows in a modern society**



Payment flows exhibit clear development trends. Cash payments are decreasing between private customers, with movement towards non-cash payments through account-based payment systems. Corporate

customers pay most of their salaries, pensions and other payments to private customers using credit transfers. A lot of private customers' payments to corporate customers are made using credit transfers, direct debits or card payments. Cash payments between corporate customers and to/from the public sector are today very rare, especially for repetitive and medium and large payments.

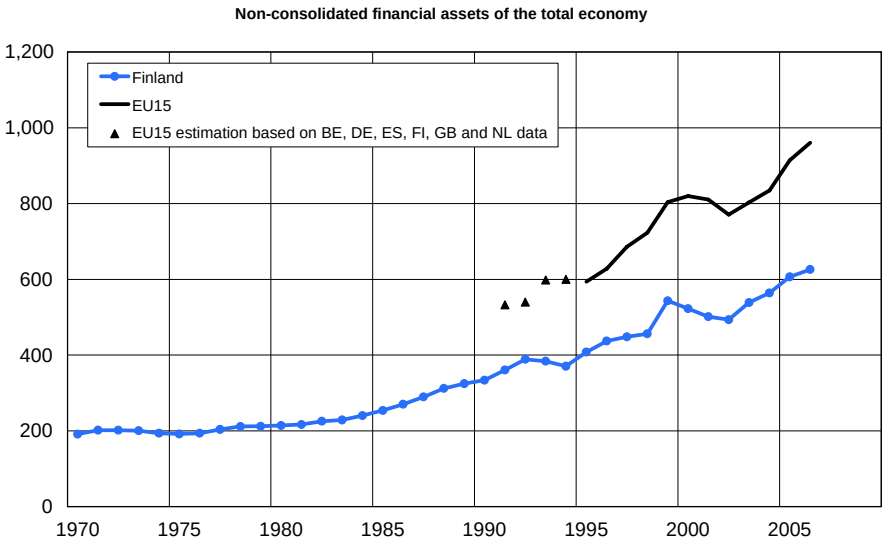
Corporate customers in particular want to integrate their payments with their data processing systems. They want to be able to process payments in straight-through-processing (STP) mode. Payment transaction costs and charges have decreased with the introduction of modern ICT. The combined result has been that it is more efficient for corporate customers to process individual invoices and payments instead of processing them in netted batches. It is now also viable to split large payments into smaller instalments to serve consumer needs. This is probably a trend which will become stronger over time, with a move to just-in-time processing of all related actions.

One major development trend is the increased use of credit instruments, where the credit institutions become part of the payment chain. More and more consumer payments are based on credit cards or part payments financed by credit institutions, while corporate customers use factoring and leasing services for financing. This results in the same payment value being processed twice or even three times in the payment system before payment is made in full. For example, in credit card payments the payments are first processed in the credit card system and then later the consumer makes a separate payment to the card company and the card company makes a separate payment to the merchant. The increasing use of part payments and leasing will add to the volume of payments, as they involve total payments being divided into smaller instalments.

Among corporate customers we can see a trend towards horizontal consolidation and vertical specialisation. There is also a clear trend towards outsourcing. This will increase the volumes and values in payment systems as previously internal services become paid external procurements.

A highly significant trend is the increasing volume of payments related to investments in securities, funds and other assets (see Figure 2.3). During the period from 1970 to 2006 the total value of private financial assets has grown more than three times faster than GDP. Aggregated assets are growing constantly, and so is the trading associated with these assets. This is typical for all parties. The total value of payment flows is less and less dependent on the production of goods and services and more and more dependent on the asset market.

Figure 2.3 **The growth of non-consolidated financial assets in relation to GDP (%)**



Source: Eurostat, Statistics Finland and Bank of Finland internal estimates.

In a similar way, the value and volumes of payments in the interbank wholesale market have increased considerably. This is due to the increased turnaround of investment volumes, in both customers' and banks' own portfolios. Interbank volumes and values have also grown due to the change from net to gross settlement. Previously netted transactions are today processed in gross in order to reduce risks.

There is also a new type of specialisation among payment service providers in which non-bank service providers or bank-owned entities provide modern electronic or mobile-based payment services outside the existing traditional bank-centred infrastructures. However, these modern systems generally require pay-ins and pay-outs of funds via the traditional payment systems, which increases the transported value, and to some extent also the transported volumes.

The above trends do, however, seem to offset each other to a significant degree on the aggregate level, as can be seen from Figures 4.3 and 4.4. The number of cashless payment transactions is slowly increasing, but at the same time they are replacing cash payments. The total amount transferred by cashless payments in relation to GDP has been quite stable over the last ten years and some of the fluctuation in the graph is due to changes in data collection methodologies. On average, payment systems transfer as customer payments the value of

GDP about 30 times a year, but national fluctuations are considerable, as can be seen from Figure 4.5.

2.3 General acceptance, trust, competition and network effects

In direct barter trade the parties have to find something to exchange that is acceptable to both parties. The introduction of cash created a general medium of exchange and a payment instrument that all or (at least) almost all were ready to accept because they could trust that it could be exchanged later for other goods and services. Money in general, and indeed any payment instrument, needs to be so trustworthy that people are willing to accept it. An untrustworthy payment instrument (or form of money) will disappear from the market, as nobody, or at least too few people, will be willing to accept it.

Acceptance is also dependent on efficiency, which will be discussed in the next chapter. Cash payments have efficiency drawbacks compared with account-based payments, as is discussed in the next chapter, and therefore payment volumes are increasingly being transferred into account-based payment instruments issued and maintained mainly by the banking industry and sometimes also by non-banks when bank services are not sufficiently competitive. In order to maintain trust in the banks and payment systems, financial supervision authorities (FSAs) supervise credit institutions and other important financial institutions, while central banks oversee payment and settlement systems. It is vital to maintain public trust that the funds in account-based money are safe and available for future use. Experiences such as bank runs would rapidly undermine this essential trust. One important task of the Eurosystem is to promote the smooth functioning of payment systems. The central banks have also developed core principals for payment systems that lay down the basic requirements for ensuring stability and efficiency.[2]

The risks involved in providing financial services have over time proved so large that, in order to protect customers' deposits and other entrusted funds, the financial market is heavily regulated. Private payment services and payment accounts can be provided mainly by banks, which are a licensed industry. This regulatory stance limits

[2] BIS (2001).

competition, and thereby to some extent also limits efficiency and development. There is often a trade-off between efficiency and stability. Excessive competition among payment service providers would increase the risks of bankruptcy, which would undermine trust in the services. There is currently a trend towards deregulation of the market in order to increase competition and efficiency. Thus, many countries have granted non-banks a limited right to provide payment services.

As payments are so central to the functioning of society, parliaments and governments have laid down laws and regulations both for safeguarding payments and for increasing their efficiency through common rules and standards. Individual private customers are often in an inferior position to negotiate on the terms of payment services provided by financial institutions. This has resulted in consumer protection regulations.

Every economy has only a limited number of payment instruments, because customers would find it difficult to manage a large number of parallel instruments and ensure sufficient funds for all of them. Merchants, the main receivers of payment instruments, would also have the burden of extra costs and other difficulties if they had to be ready to accept a large number of different instruments, especially if these all involved different processing, control and hardware requirements. Payment transportation is a bulk commodity service in which customers normally just want to get the work done easily at low cost. Customers also find it important that funds can be transferred between different service providers and banks. An interbank payment infrastructure is essential: otherwise customers could only make payments to other customers of the same bank. Hence, in order to provide generally accepted private payment instruments banks must cooperate in designing the interbank infrastructure and the rules and conventions for common payment services and instruments. This need for interbank cooperation in payment service development and provision limits competition and very often results in quasi-monopolistic interbank payment infrastructures.[3] An example would be one national automated clearing house (ACH) for processing all interbank payments. Having parallel ACHs would increase the total fixed costs, and there is therefore quite strong incentive pushing towards monopolistic solutions.

These monopoly structures have often emerged due to what are called network effects. For a network good, the overall benefit of the

[3] McAndrews (1995).

good increases the more users the same good has. In payments this can be seen in the usage of a given payment instrument. For example, the more users a given type of payment card has, the more willing merchants are to accept that card. As the years pass, smaller competing schemes will generally disappear or merge into the major schemes. Payments are a very typical network good, and one that could not exist without the very large logical and physical networks that provide the basis for payment processing. All service providers have to be linked to an interoperable network in order to facilitate the transportation of payment funds from one account to another. All modern electronic payment services will be dependent on a number of different telecommunications networks, both between different service providers and between service providers and their customers.

The network effect together with the cooperative service provision stance has resulted in quite specific national payment habits. As we will see in the statistical section, some societies are clearly cash and/or cheque based societies, while others are more credit transfer based. In some countries cheques have been replaced almost completely by debit card payments. The use of direct debits also varies considerably between countries. There are quite distinctive payment profiles for each country, which are quite stable. Customers seem to be very reluctant to change their payment habits and need to have several quite strong incentives to do so. As we shall see in the pricing section, it is often also the situation that the traditional pricing mechanisms in payment systems do not work efficiently in situations of change due to a considerable part of the payment pricing being hidden by non-transparent pricing mechanisms and cross-subsidising.

The network effect also presents a chicken-and-egg problem for new services. Any new payment service has to overcome the initial hurdle of creating a critical mass. This will become more difficult all the time due to the dependence on technology and the legacy of existing investments. During the age of paper technology, a change in services could be made by informing the relevant parties (generally only a part of the bank's own personnel), making changes to the operating manuals and producing some improved paper forms. In the electronic age of today, any changes in services will affect a multitude of payment applications and transmission networks, not only in banks and their infrastructures, but also increasingly at merchants, corporate customers and even private customers. Therefore, over time it will become more and more difficult to implement changes, as the change process itself will be so difficult to manage and there will be so many stakeholders with vested interests. This has in some cases already required central banks or other authorities to step in as coordinators or

catalysts to speed up developments in the desired direction. The SEPA (Single Euro Payments Area) undertaking is a clear example of an authority-pushed development.

This coordination problem increases with the size of the economy or payment area, because of the larger number of stakeholders. It seems, moreover, that the bigger the economy, the more bank management becomes alienated from customer needs. Customers also find it harder to press for service development as they become more atomised in large economies. The overall efficiency and inefficiency of payment habits is more apparent to decision-makers in a small country, and it is easier to agree a common plan for improvement.

An additional source of the slow pace of development in the payments markets is the complement good mode of payments. Nobody makes payments or buys payment services simply for the joy of making payments. Payments are always tied to an underlying economic transaction in the other direction. This means that the demand for payment services is quite fixed and any new payment developments would only move volumes from old instruments to new ones. Service providers, therefore, often find themselves in a situation where there is no incentive to invest in service development, as this will not improve their business opportunities, but simply result in the unnecessary risks of change. The customers must in any case take what is available if banks do not cooperate in developing new services.

These external requirements and effects result in a situation where payment system development is slow compared with open competitive markets. Service providers have major disincentives for change, and the dispersed customer base lacks the power to force change. Due to the lack of competition and the hurdles for development inherent in the payment industry, this results from time to time in a situation in which authorities that have regulated for the required stability also have to be active in regulating for development and efficiency in order to help the market move on to the next level of efficient payment processing. The barriers to change cause an accumulation of development pressures that, once released, result in a process of development that is both rapid and extensive.

2.4 Development of payment services and instruments

The general areas for development in all kinds of transportation services are:

- transportation costs;
- speed;
- security;
- user interface efficiency;
- user integration support.

Faster development in payment services is important due to the very large volumes, amounting in total to over EUR 100 billion per year in the EU15 area alone. With volumes of this size, cost benefits of a few cents will produce considerable savings.

Modern funds transportation services are much cheaper than in the past. IC costs are decreasing very rapidly, with costs for telecommunication resources, storage resources and processing resources being halved every 18 to 24 months at current trends. Costs have gone down and throughput increased so much that the IC costs for processing single electronic payments will soon fall below one eurocent. With modern equipment and completely electronic processing, the costs are on the same level as for processing e-mails. The important issue for the industry is to take full advantage of this trend. Currently the jungle of old systems seems to be holding processing costs at too high a level. In this area the main focus is on improving the efficiency of the payment industries' internal processing. The cost issues are discussed more concretely in Chapter 5.

IC technology has also improved delivery speed in almost all industries, and especially information-based industries. Internet-based newspapers are updated and distributed in real time. Previously there has been a balance between speed and cost of delivery, but IC developments have completely changed this situation. As many industries have discovered, from the point of view of transportation costs, immediate delivery is cheaper than delayed delivery. The main focus in this area is on internal efficiency, although service providers also need to employ fast connections between customer and provider, ie e-banking solutions.

Modern IC technology has, additionally, provided new tools for electronic security. In this area there is still a clear balance to be found

between security costs and the costs associated with a lack of adequate security, a balance between the remaining risks and the additional costs associated with marginal risk reductions. Over the years, banks have been forced to considerably improve payment security because of losses due to criminality. The process has been continuous, with major improvements in cash transportation safety, cheque and card technology security features and customer identification methods. E-identification and data encryption are essential for banking services in the Internet age. In order to manage risks, banks have had to introduce new security methods and features to be employed by their customers. This can only be done in cooperation with the customers, considering their hardware and software environments plus the need for customer education.

Until the 1970s, customer interfaces were manual, paper-based and branch-centred. Everybody walked to their bank branch or sent payment documents by mail. Since then we have witnessed a continuous change towards advanced electronic banking relationships, e-banking. Customers visit their branches less and less frequently, and branches are being closed down (see Figure 4.36). Instead, different kinds of e-interfaces have become popular. This is in most cases a convenience choice, because e-banking provides payment services faster, around the clock, from anywhere and without queuing. Some banks provide a clear self-service incentive via cost-based tariffs, which are lower for self-service than for teller service. E-banking requires the establishment of IC standards so that corporate customers, in particular, can send bulk payments directly to banks' IC systems, or receive electronic information from the banks. The rate of self-service will grow close to a hundred per cent during the coming years for bulk payment services. The growth of self-service put an emphasis on proper customer education. Banks also need to build new user interfaces according to customer needs and capacities. The web-based interface will be the new front window to the bank. There is a completely new world of suitable active and intelligent user interfaces that adapt automatically to individual user needs. Web-based customers will probably also be more mobile as customers and inclined to change to a new service provider, when this is just 'a few clicks away'.

However, the main emphasis has for a while been on customer integration support, and this will remain the case for many years to come. The user interface makes the payment data and systems available to the customer, but the main benefits of new technology lie in integrating payment services with customers' internal services like ordering, invoicing, etc. The main issue is end-to-end customer

integration, and this applies to all industries. It is an integration of the processes in a network of cooperating computers. This will require redesign of the payment process so that there are sufficient data fields such as reference codes and keys to support the logical flow of completely automated processes. For these developments, banks will need to cooperate with customers to design an overall process to which every participating entity delivers their clearly defined parts. There will probably be a number of completely new developments in this area that were not possible in the old paper- and batch-based processing, but can emerge in the interconnected real-time world of the Internet.

A number of general payment methods have emerged over the years. Cash is still popular, but is continuously losing volume to account-based payment methods. The basic account-based methods are credit transfers, cheques, direct debits and card payments. These are all variations of the same basic payment process by which funds are transported from the payer's account to the payee's account. The different alternatives have developed in order to provide increased efficiency in certain types of payment situation. The credit transfer is a payer-initiated credit push process, while all the others are payee-initiated debit pull processes. A more thorough description of the development of the different payment methods can be found in Chapter 3.

The cash payment process has also changed over the years and become closer to account-based payments, as recirculation of cash is carried out mainly via banks and not from customer to customer. Cash is becoming more like fixed value cheques such as travellers' cheques. The main reason for customers to abandon the use of cash nowadays is its lack of electronic interfaces and scope for integration. However, cash does have the quality of anonymity, which is seldom found in account-based payment instruments, as these need to leave an audit trail. Private customers value anonymity in different kinds of sensitive transactions. However, this feature means there is also quite a big demand for cash payments for criminal purposes such as money laundering and tax evasion, or as the object of criminal activities, eg robberies. These aspects of cash are presented in Chapter 9.

The new forms of Internet and mobile payments are actually different kinds of account-based payment using modern interfaces and integration features. They can be seen as variations of the basic account-based payment instruments, and their processing patterns resemble mostly those of credit transfers. They are often brought to the market by non-banks, which seem to be more interested than traditional banks in providing new advanced services.

Developments in payment instruments have been rather domestic in nature, resulting in national standards. It is only in the area of card payments that we find truly international standards. Recent developments have put more emphasis on international standards, which can be seen for example in the European SEPA initiative.

2.5 Payment institutions and infrastructures

Banks and other credit institutions form the basic service providers for all kinds of payment services. The payment/deposit accounts of banks are the origin and destination addresses for paid funds. In order to secure the funds on bank accounts, the banks are regulated and supervised. Any regulation and supervision imposes costs on the service provider. However, the objective is to establish a stability level for important services in line with optimal long-term social needs (see Chapter11 for details).

Regulations, and especially license-based regulations, also reduce competition in the market. A market failure, a situation in which the market provides services of sub-standard quality and at above reasonable prices, can therefore more easily emerge in heavily regulated markets than in competitive markets. This is one reason for the debate currently being conducted, especially in Europe, on the need to extend to non-banks the right to hold customer funds and provide payment services.[4] It is assumed that opening the market to more competition will promote developments in payments, which are thought to be lagging behind. Opponents of this kind of policy warn of the risks of uncontrolled service providers and regulatory arbitrage.

Banks provide the bulk of account-based payment services in the form of credit transfers, direct debits and card payments as well as cheques in countries where these are still popular instruments. Other kinds of payment service providers operate generally in niche areas like travellers' cheques, money remittances, revolving credit cards, etc. However, in trials of modern electronic e-payments and mobile payments, non-banks seem to have a quite large role to play. Special schemes of different kinds are being established, and telecommunication companies in particular seem interested in providing mobile payment services. Most of these kinds of new

[4] The Payment Service Directive to be implemented in November 2009 will introduce a new type of financial institutions called Payment Institutions with the license for providing payment services.

schemes are local or national in scope, and most have failed to reach critical mass and have therefore closed down after a few years.[5] However, a new breed of international e- and m-payment schemes seem to be emerging and even acquiring critical mass as they build on synergies with other network products and find backing from big international companies.[6]

In the cash cycle, banks have a central role between the central banks and the end-users. In developed countries, most of the cash is handed out to consumers via ATMs. In order to improve the logistics of the physical cash handling, specialised and often centralised cash distribution companies have been established. These often serve all cash points, eg branches, ATMs, merchants, etc.

For all payment instruments the payment service providers need to be connected to each other in order to facilitate the transportation of funds between the different service providers that is essential to providing the necessary reachability. This requires the interoperability of payment instruments and their infrastructures between service providers. This is also true regarding modern cash services utilizing ATMs and efficient cash centres.

The essential task of the interbank/service provider infrastructure is to forward the fund transfer from the payer's institution to the payee's institution, including the cover between these institutions. The critical parts of the infrastructure are:

– the agreed rules for transfers;
– the physical transportation network;
– the routing mechanism and account addresses;
– message and other standards;
– the interinstitutional settlement method.

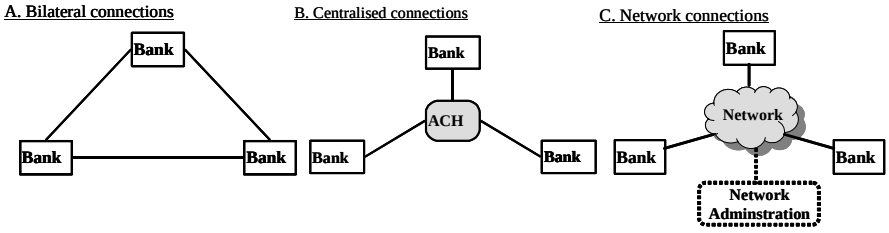
Each infrastructure needs to define its own rules, which is done via rule books, contracts and legislation. The legislative part can vary considerably from case to case. For example, the rules for cheques are often more legislation-based than are those for mobile payments, as separate legislation has not yet been enacted for the most modern instruments.

Transportation network. There are basically three general network designs: bilateral connections, centralised connections and network-

[5] Jyrkönen and Paunonen (2003).
[6] PayPal, Google, Yahoo, Microsoft and Vodafone are some of the companies that are operating or have published plans for payment services.

based connections (see Figure 2.4). Bilateral and centralised connections can be used for both physical and digital networks, while the network-based solution is a modern structure available in electronic networks, typically the Internet.

Figure 2.4 **Alternative infrastructure network designs**



With bilateral connections, each institution builds up a bilateral relationship with all the other institutions. With centralised connections, a central institution is established, often referred to as an Automated Clearing House (ACH), to which everyone sends their interbank payments, and from which they receive their incoming payments after the sorting process in the ACH. With network connections, a common electronic network with a built-in routing possibility is established between the institutions. The sending bank simply attaches the correct network address to the payment and it is forwarded directly to the receiving bank (comparable to sending e-mails). Traditionally, bilateral connections were efficient in networks with few banks, while centralised ACHs were needed for physical sorting in networks with a large number of participants. Modern technology has made the network connection structure the most efficient for all sizes of digital transportation networks.

In practice, for historical reasons, these different network designs are used in parallel. For some payment instruments, regional ACHs have been established, while for others, bilateral or network-based solutions are used. The international payment network SWIFT (Society for Worldwide Interbank Financial Telecommunications) is a typical example of an organisation for bilateral payment connections evolving towards network-based connections.

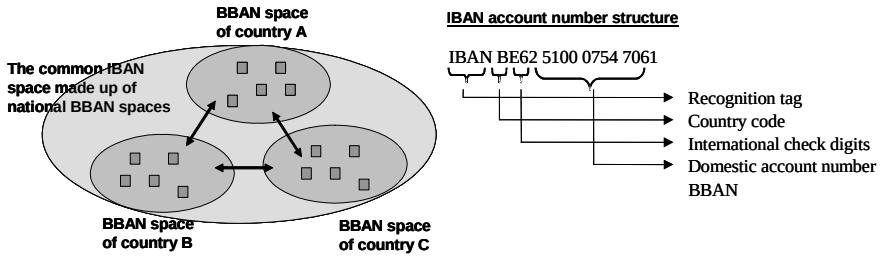
Routing mechanism and account addresses. In order for payments to be transported between payers' and payees' accounts, these both need to have their own unique address. Each infrastructure needs addressing systems that identify both the institution and the account.

This is generally accomplished by creating a common address space that is shared among the participating institutions by creating specific subparts for each of them to administrate for their customers. The traditional account identifiers for payments are the account number and the card number. In the basic setup both have a front part identifying the institution and a trailing part identifying the customer account. Both have also check digits for immediate control of typing errors.

Card numbers have a very straightforward design based on international ISO standards. The first six numbers constitute the institution identifier, or Bank Identification Number (BIN). This is followed by the customer account identification number, unique within the institution and the card number then concludes with a check digit.

Bank account number standards are more complex, as they are based partly on different national numbering systems that have been embedded in an international account numbering scheme called IBAN (International Bank Account Number) (see Figure 2.5). The IBAN structure resembles the telephone numbering space, because it starts off with a country identifier, the two letter country code, in order to bring uniqueness on the international level. This is followed by an international check digit. This international 'header' information is followed by the national basic bank account number (BBAN). This means that the institution information has to be found using different national coding systems from the BBAN. Countries have over time created their own national bank account number spaces with different ways of coding the institution address at the beginning of the BBANs. However, there are international tables and modules used for deriving the institution addresses from the BBANs in the IBANs. In international payments, a separate institution identifier called BIC (Bank Identification Code) is generally used. There is currently a debate on whether customers should also provide the BIC information for transactions based on account numbers or if banks will build automated processes for deriving the BIC information from the IBANs. This is an efficiency issue, in which an automated process is clearly the most advantageous over time.

Figure 2.5 **The structure of the international bank account number (IBAN) space**



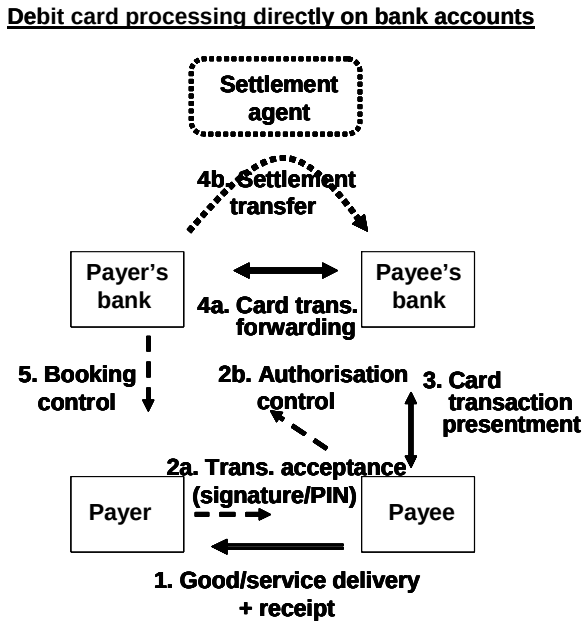
The addressing system is the technical basis for routing payments. However, it is also essential for participation and recognition in interbank services. Newcomers have to be assigned their own slots in the numbering space and become recognised and fully fledged participants. This means restrictions in employment and assignment of the addressing space can be used for fending off new entrants.

Primary and secondary infrastructures. The general payment process and the parties involved can be described using a four-box model consisting of the payer and the payer's bank plus the payee and the payee's bank. The banking system and its interbank payment transfer systems provide the primary infrastructure for fund transfers between customers.

We can, however, see a growing number of specialised payment systems that build upon the primary infrastructure but develop a specific secondary infrastructure on top of it. This results in a two-phased payment process in which the actual payments are processed within the secondary infrastructure, but before and/or after the payment situation another liquidity transfer is made between the primary system and the secondary system. An example of this kind of structure can be found in credit card systems. In these, the payment is first processed as a credit card payment within the system and later a pay-in payment is made from the card holder's bank to the credit card company and, in the same way, the credit card company makes a pay-out to the bank account of the merchant. We can find the same kind of two parallel infrastructures used in e-money schemes, where first a payment is made to the e-money scheme from the user's bank account in order to establish an e-money balance which can be used for payments, and after payments have been made the accumulated merchant balances are credited to the merchants' bank accounts.

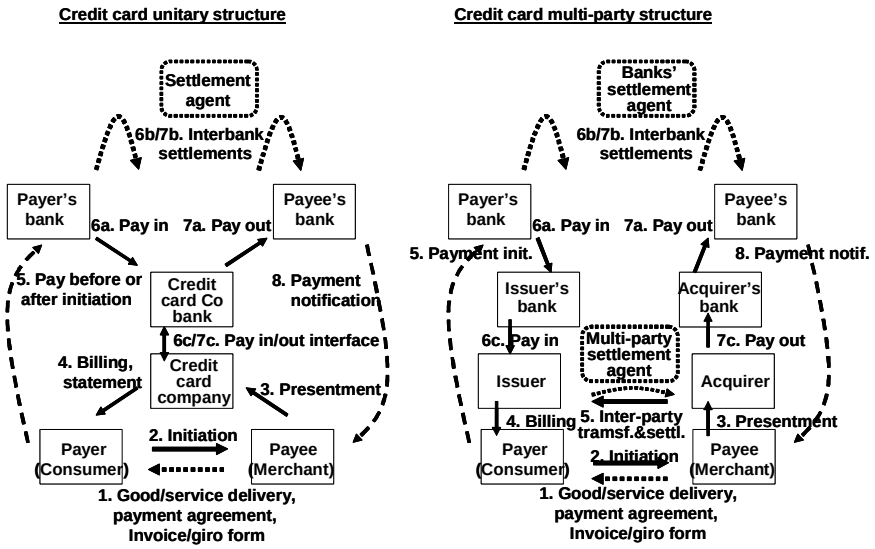
These secondary systems can consist of a single service provider or multiple service providers with a secondary interbank settlement and clearing facility. The general structure in a primary infrastructure for exampel the debit card processing is described in Figure 2.6.

Figure 2.6 **Basic primary infrastructure (debit card transaction processing directly on Bank accounts)**



The structure used for credit card processing involving a parallel secondary layer is described in Figure 2.7.

Figure 2.7 **Primary and secondary infrastructures employed in parallel (typical credit card transaction processing involving separate credit card companies)**

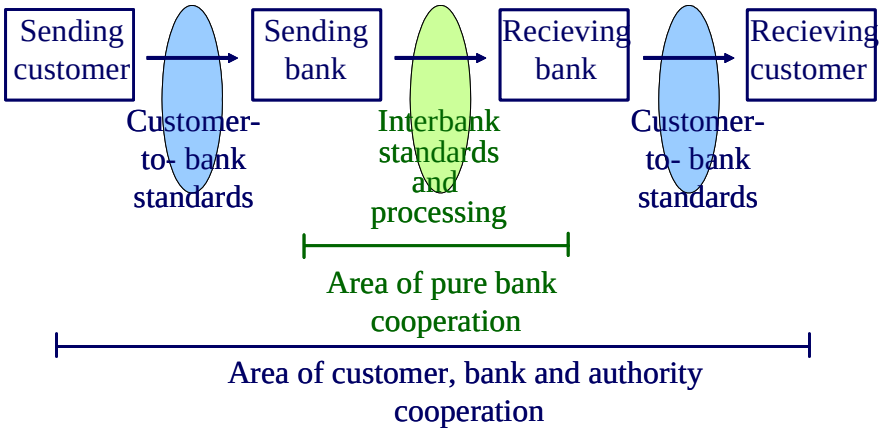


There would appear to be two main reasons for establishing secondary infrastructures: specialised payment instruments and market segmentation. When the primary infrastructure is not interested in serving specialised market needs (eg traveller's cheques) or modern developments (eg Internet-based e-mail payments such as PayPal), these kinds of service can be provided via a secondary network. Segmenting some payment services such as credit card payments to their own specific networks gives the service providers a better chance to segment the market and thereby improve margins. Basically, a large use of secondary infrastructures points towards undeveloped primary networks and primary services and a lack of competition. A secondary network structure implies inefficiency, as the secondary layer introduces overheads and other extra costs that would not be present if the same service were available directly in the primary network. Currently, it seems to be often the case that modern e-based solutions are established in secondary structures, at least to begin with.

Standardisation. In traditional paper-based payment systems the payment information was carried on standardised paper forms such as cheques, giros and card payment slips. In modern systems these are all

replaced by electronic messages. Electronic messages are the basis for straight-through-processing without manual intervention. These are also the basis for customer integration benefits.

Figure 2.8 **The standardised end-to-end payment process**



The message flow should contain the essential data needed in all phases of the process, including the data needed by the payer and payee. Without the data fields needed by customers, the benefits of user integration cannot be achieved. In addition to payment initiation and reception, the message flow should also include messages for the most frequent exception-handling cases and inquiries.

Standards should also cover the electronic/network interfaces between customers and banks. In modern services, bank connections are e-banking-based using the Internet or other public network services.

Customer identification can basically use three different methods: customers' physical characteristics (eg signature), customer possession of some object (eg card) and customer possession of some memorized code word (eg PIN number). In order to achieve interoperability, these identification methods need to be standardised in the infrastructure. This will often also require standardisation of tamper resistant hardware such as cards and terminals in order to safeguard the key identification data. The different hardwares also need to be able to communicate with the rest of the infrastructure, and this requires communication standards.

Interoperability and openness. The basic objective of the payment infrastructure is to establish interoperability and openness. Customers need to be able to freely select a service provider and still be sure they can reach any other customer banking with any other service provider. They can use the available payment instruments freely according to their own choice without limitations imposed by barriers due to non-interoperable standards, etc. Proprietary standards always to some extent lock the customer into a given service provider, while open standards facilitate competition. Bank-specific standards and service rules generally limit interoperability. However, it is essential that the common standards conform to best practices, ie they include all necessary data elements and functions and the format used is up to date with general developments in ICT standards.

2.6 Liquidity issues

A key requirement for successful payment completion is sufficient liquidity on two levels: the payer and the payer's bank. In payment processing, the term liquidity refers to the availability of funds for making the transfer. Liquidity can be in two forms: a positive balance or a credit line on the sending account that makes it possible to make an overdraft for the sent payment. In order to reduce the credit risks, real-time liquidity checks are becoming the norm on both levels, thereby limiting possible overdrafts to a certain predetermined level.

Corporate customers, in particular, are nowadays paying more attention to cash and liquidity management. There is increased interest in investing any excess liquidity in short-term deposits, which requires good estimates on incoming and outgoing payments. There is also interest in real-time information on account balances and any changes therein. The focus on liquidity budgeting is moving towards shorter, even intraday, time periods.

Banks' liquidity positions depend on the outflow and inflow of payments. In deferred net settlements, they only need to be able to cover the net positions, while in continuous gross and net settlement systems they need to have funds and/or collateral to cover the largest negative balance fluctuations during the day. As online processing has increased especially for large-value payments, banks have been obliged to move to continuous settlement of their interbank positions. In real-time gross settlement (RTGS) this is done by immediate bookings on the settlement accounts, and if there are not enough funds for bookings the transactions are queued or discarded. In continuous

net settlement (CNS) systems banks have a credit limit in the system (or bilaterally) against which all transactions are booked. Transactions that would violate this credit line are queued or discarded in the same way as in an RTGS system. The credit line can be partly or fully collateralised. Central banks' general requirement has been that CNS systems should require at least enough collateral to ensure the largest negative position could always be covered in a default situation.[7] There seems to be a general trend from only partly collateralised overdraft-based systems to gross settlement or fully collateralised settlement. The objective in requiring settlement in gross, or using full collateral, is to prevent systemic risk situations, where the credit risks concerning one defaulting participant could be transmitted through the system and also affect other participants.

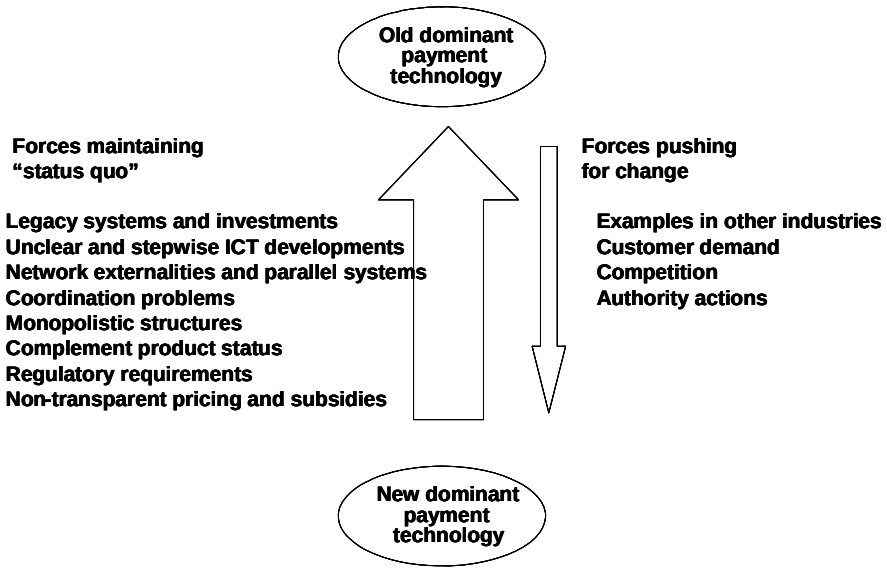
The move to real-time processing has brought a completely new focus on intraday liquidity to banks. Banks have to reserve sufficient liquidity for every second if they want to avoid the queuing of important payments. As the number of customer real-time payments increase in the future, any bank liquidity shortages would be visible to customers as delivery delays. Most of the large-value payment transfer systems today require immediate settlement in central bank money or fully collateralised credit positions.

2.7 Development incentives and disincentives

Market developments depend on sufficient incentives. As we shall see in the chapters that follow, the payments industry has a large number of built-in factors that delay the process and quite a few that speed it up (Figure 2.9). These development incentives are especially important when the industry needs to move from an old dominant technology to a new, more efficient technology that will then become the new dominant way of paying.

[7] Originally the so called Lamfalussy requirements, which are today incorporated in the core principles for systemically important payment systems, see BIS (2001).

Figure 2.9 **The forces maintaining current technology and the forces pushing for change**



There is a large number of forceful factors acting against change in payment services and a rather limited number of less strong forces towards change. However, the situation is changing with the technical developments in other industries. As we shall see in the discussions in the following chapters, non-transparent pricing and limitations on competition are probably the main factors delaying developments. However, external competition seems to be increasing and will probably trigger developments inside the industry.

2.8 Summary of general developments in payment processes

Payment processes are under continuous development, and the speed of development has increased in recent years. Customers are moving to electronic payments, and the electronic payment processes are becoming integrated with other business processes. The main areas of development are savings in processing costs, delivery speed approaching real-time, improved security and, especially for electronic remote transactions, convenient and efficient user interfaces and the automatic straight-through-processing integration of payments

with other business processes such as invoicing and ordering. Payment infrastructures are standardised and moving towards network-based models suitable for the e-world in front of us. In order to provide efficient worldwide reach, common payment account addresses (International Bank Account Numbers) need to be implemented. Customers will require common general payment standards in order to be able to integrate payment processes with their own systems. Interoperability and openness is required in order to promote competition, which in turn will speed up developments.

3 Development and efficiency of individual payment instruments

This chapter looks at developments in the different payment instruments. The instruments studied are:

– cash
– credit transfers
– cheques
– direct debits
– card payments
– e-payments and mobile payments.

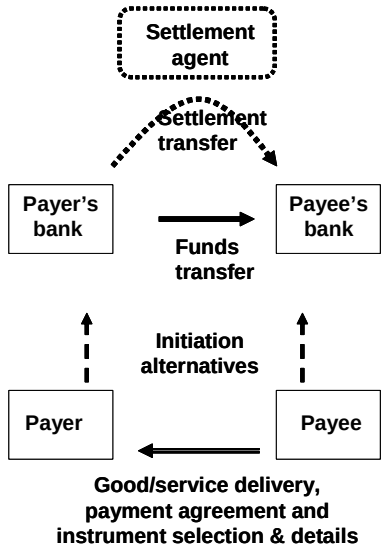
General areas of development for all kinds of transportation services are:

– transportation costs
– speed
– security
– user interface efficiency
– user integration support.

These are analysed for each payment instrument.

The payment process for each payment instrument is described using a basic payment scheme as described in Figure 3.1. Payments are essentially transportation tasks in which funds are transferred from payer to payee using predefined rules and methods that are characteristic for a given payment instrument.

Figure 3.1 **The basic payment process**



The general payment process can be described using a four-box model with the payer, payee, payer's bank and payee's bank as the main participants. Here, the term 'bank' is a shorthand for all kinds of payment account service providers, including, for example, credit card companies. The process begins with the payer and payee, who agree, as part of a good or service delivery, that a given amount of funds need to be transferred in exchange. They select a payment instrument acceptable to them both and specify the necessary payment details. The instruction to the bank can be made by either payer or payee, which divides the process into credit push instruments (credit transfers) and debit pull instruments (cheques, direct debits and card payments).

The core of all payment processes is the funds transfer from the payer's payment account to the payee's bank account. Because the funds are transferred from one bank to another, there is a need for an interbank fund transfer using a common settlement agent – ie in addition to the fund transfer information, the sending bank also needs to send real funds to the receiving bank. For stability reasons, the settlement agent is often a national central bank. The need for interbank settlement distinguishes the payment process from other types of data transportation systems. When the payment process can be accomplished within the same bank, the settlement process is not needed, and the process is simplified to one intrabank account

booking between customer accounts. However, we use the general model with two banks because in a market with competing banks this will be the base model. Developments in the different payment methods are described below using this four-box model.

3.1 Developments in cash usage

The need to physically transport cash separates it from the account-based instruments. Cash is a bearer instrument in which the value is part of the physical instrument. If cash is destroyed while in the possession of a customer, the value is destroyed at the same time. Although cash is a very old payment instrument, some recent developments can be observed.

Costs. Customers lose interest opportunities when they hold cash rather than using account-based instruments. With cash, it is the issuer, generally the central bank, that receives the interest benefits, called seignorage. The seignorage can therefore be seen as an income transfer from cash holders to the general public via the central banks. However, this means that customers try to reduce their cash holdings to the essential minimum in order to save on interest. Banks and merchants have streamlined cash transportation processes by using specialised entities. Different kinds of machines are used for automated packaging, sorting, quality control etc. The same modern logistic technology is used as for other forms of physical goods.

Speed. Improvements in the speed of processing cash are strongly limited by the need for physical transportation.

Security. The security features of cash have been improved considerably over the years, because technological advances in colour printers and scanners have made it easier for forgers to make good copies of notes. The problem in this area is to find security features which are usable in the payment situation by the payer and payee to verify the genuineness of notes, not only in laboratory environments. The security features have also to be sufficiently low-cost in order to be affordable and competitive with other instruments. Compared with account-based instruments, the authenticity of cash depends on the features contained in the physical instruments rather than establishing the user’s access rights to a given account. Due to the feature of

anonymity, cash lacks the security of audit trails used with account payments.

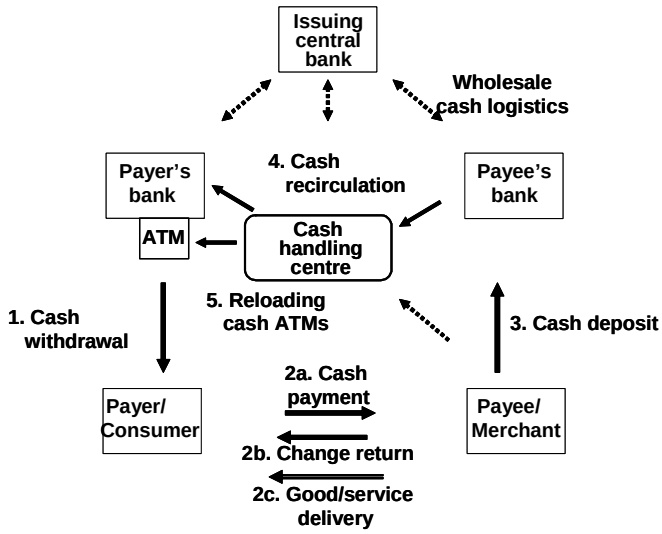
Interfaces. In order to reduce costs, banks have employed self-service ATMs for cash distribution, and in many countries these are the main method for distributing cash to the public. Merchant interfaces have generally not been automated, being instead centralised in cash centres with modern logistics. These cash centres can reduce the need for transportation, as the same cash centres receiving cash from merchants can load it directly back into ATMs. Cash-based vending machines of different types provide self-service interfaces.

Integration. Due to its physical nature, cash payment cannot be integrated into the internal systems of payers or payees. It cannot be used in Internet or other remote payment situations.

Over the years, cash processes have begun to resemble the account-money-based process and can be well described by the four-box model. Payers withdraw cash from their bank accounts via ATMs and carry the cash to payees/merchants, who will in turn carry it back to the banks. These will then book the funds on payees' accounts and put the cash back into ATMs. Consumers who pay with cash generally receive their income as salary or pension credit transfers to their accounts. The payees in cash transfers, the merchants, make their payments to suppliers or employees via credit transfers, so the cash has to be deposited on a payment account. The main payment notes (ATM notes) are used once only before being returned to the banks; ie they have become more like fixed-value (traveller's) cheques. Merchants therefore also play an important role as provider of smaller denomination notes and coins in the form of change, as ATMs mostly provide a very limited number of denominations. The most typical example of 'short-circulation' cash is when consumers make withdrawals from ATMs in malls and supermarkets in order to pay for their purchases in the stores. Due to the need for physical transportation, cash has a clear cost-efficiency drawback compared with electronic account-based instruments, as is described in the chapter on payment costs. The cash payment process is described schematically in Figure 3.2.

EMU created a common cash area in Europe. There is a long tradition of cash in the most common and stable currencies being accepted in other countries. Over the years an infrastructure of cash imports and exports has developed to service demand for currency exchange services.

Figure 3.2 **The cash payment process**



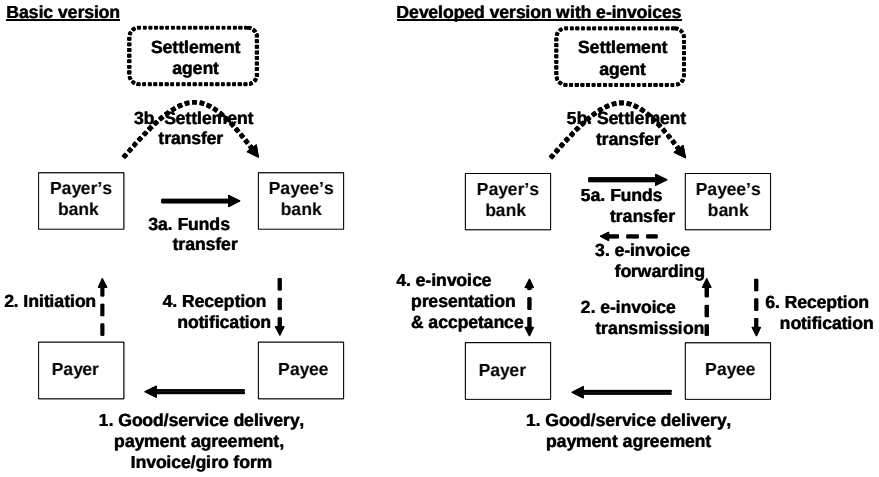
There have been trials in some countries regarding something called electronic cash (e-cash), either publicly or privately issued. However, as electronic bits can always be copied without making any trace of the copying, electronic data content cannot be used as bearer instruments. There always has to be some kind of money account solution keeping track of the funds on some kind of computer (chip, micro, server or mainframe computer) with proper audit trail features. All types of e-cash solutions are therefore regarded as different forms of account-based payment instruments, and the development of these are described in Chapter 3.6.

3.2 Developments in credit transfers

Credit transfers have emerged because it is easier, when both customers have a payment account, just to ask the bank to move the funds from one account to another than for the payer to withdraw cash that is then later deposited by the payee. Credit transfers transport the funds without the need for physical transportation. Credit transfers have existed for centuries, but their use became much more widespread during the 20th century. They are clearly more popular in some countries than in others, as we can see from the statistics in

Chapter 4. One reason for this has been the increasing use of credit transfers for government payments such as salaries, pensions, social benefits etc in these countries, which has stimulated the private sector to follow suit. Getting a pay cheque, wages in cash or a direct salary deposit seems to affect people's payment habits in general.

Figure 3.3 **The credit transfer process, plain version and advanced including e-invoicing**



The basic credit transfer process consists of a fund transfer from the payer's account to the payee's account, including the settlement transfer between banks. Credit transfer is a credit push process, as the funds are 'pushed' from the payer's bank to the payee's bank, which are the active partners in the process. (Direct debit is a debit pull process, where the payee and the payee's bank 'pull' the funds from the payer's account.) The interbank settlement in credit transfers is also 'push'-based. The credit push process contains very little credit and instrument risk, as the payer is identified by his/her bank, the money is debited from the payer's account before processing, and the payee's bank will in most cases only credit the payer after the interbank settlement is secured. Over the years, this process has developed considerably as a result of electronification and integration.

Banks have created general international conventions for international credit transfers. These are most often exchanged via correspondent banking relationships based technically on SWIFT credit transfer processing messages. In Europe, separate area-wide credit clearing facilities have been developed by EBA (Euro Banking

Association) services Euro1 and STEP2. The Eurosystem central banks also provide urgent credit transfer support within the TARGET system.

Costs. Replacement of manual handling of paper instructions by automated straight-through-processing (STP) has resulted in major cost reductions. The basic requirement for STP is an efficient and standardised account numbering scheme and standardised messages. Account numbers have been standardised on the national level and an international account number standard, IBAN, is just emerging. The lack of such a standard has until now hampered international STP solutions. Banks have in almost all countries established completely electronic transfers between their processing centres, initially using magnetic tapes and nowadays using network connections. Branch and personnel costs were substantially reduced when customers adopted e-banking or, in some cases, the use of self-service credit transfer teller machines (payment ATMs). The sharply decreasing trend in IC costs will continue to reduce costs overall. International developments like SEPA will make international transfers more efficient during the coming years. Moreover, customers have been able to greatly reduce their internal costs through the integration of banks' and customer systems.

Speed. In the paper-based credit transfer process, processing speed was dependent on the physical transportation distances and processing patterns. Before SEPA, delivery often took more than five or six days in cross-border payments, and two to three days in domestic payments.[8] The use of ICT made it possible to reduce delivery times to one to three days in a batch-processing environment, depending on the frequency of the batch cycles and the need for physical transportation of data media. The recently approved Payment Services Directive (2007/64/EC) stipulates a maximum credit transfer delivery time of one day upon its implementation in November 2009, but leaves open the possibility for agreeing with customers on a maximum three day delivery time until 2012, with one day extra for paper-based instructions. However, current telecommunication services and real-time processing make it possible to provide same day delivery, and even immediate or close to real-time delivery. Banks in many countries currently provide a higher-priced same day delivery

[8] The Credit Transfer Directive 97/5/EC stipulates cross-border delivery time of 5+1 banking days within EU.

alternative in parallel with a slower general processing alternative. Intrabank payments are often faster than interbank payments, especially when banks have real-time account systems. Competition and reduction of float possibilities will probably soon result in real-time becoming the norm, as this is also the less costly alternative with modern technology given that errors and other special situations are less costly to handle in real time.

Security. There are two important security issues in credit transfers: identifying the paying customer's right to the funds and verifying the correctness of the payee's account. Tellers have traditionally required normal identification documents, while self-service ATMs have required bank cards with PIN codes. However, it has been more difficult to find secure and low-cost identification solutions for remote e-banking over the network. A list of one-time passwords has proved to be a functional low-cost solution when used together with SSL (secure socket layer) encryption. However, criminals are increasingly using various types 'phishing' in order to get hold of customer identification information. There are several e-identification proposals or trials based on PKI (public key infrastructure) solutions, but the problem has been standardisation and interoperability between service providers in order to solve the problem of a common service provider for the bank and its customers (see Chapter 8 for details). There are also several non-standardised devices for password generation or online identification/encryption used by banks for customer identification. There is a clear need to find a general standardised solution for all kinds of e-banking solutions that can be used by all customers and all banks.

Interfaces. The basic interface for credit transfers has been giro (payment instruction) forms, which state the information required: sending and receiving account numbers, payer and payee details, due date, value to be transferred and remittance information. These giro forms have been national, sometimes even with several standards in the same country. An international standard, IPI (international payment instruction) has been proposed by European banks[9], but has not yet been implemented in any country. In order to facilitate automatic reading, giro forms have been designed so information can be scanned using different optical methods. Reading of handwriting and optical characters has generally been carried out in centralised

[9] See www.ecbs.org.

processing centres, while bar codes have enabled low-cost decentralised scanning at branches, by teller machines and also by customers themselves. For e-banking solutions, paper formats have been copied to create 'look-alike' screen interfaces for customers. For corporate customers, special national credit transfer message standards have been created for sending and receiving credit transfers electronically. The electronic statement of account is an important vehicle for receiving credit transfers in electronic format. There is a clear need for international automated interfaces in the form of electronic credit transfer messages for customers. European banks have defined an ePI (electronic payment initiator) for credit transfers[10], but this is not yet being applied anywhere. SEPA developments include the announcement of common XML-based (extended mark-up language) customer standards based on IS0 20022 developments, and these will hopefully provide both a SEPA standard and a wider international standard[11], because common standards are needed to promote increased usage of electronic interfaces.

Integration. Automation needs to be extended to customers, who need to be able to integrate payment data directly into their internal systems using automated interfaces. Payees in particular need to be able to use the remittance information to update their receivables files automatically. In some countries (for example the Nordic countries), the basic tool already available with paper forms has been a structured reference code for the payee. The payee defines a numeric reference code protected with a control digit for each giro/invoice sent out, and this is transmitted as part of the payment data with received credit transfers. This facilitates automatic reconciliation of receivable files. However, in the future we will need much deeper integration, and banks in some countries (eg the Nordic countries) have therefore introduced e-invoicing services by extending the payment information and providing transportation services for e-invoices. This improves the scope especially for corporate customers to redesign and merge their accounting, payment and invoicing processes for increased efficiency (see separate section in Chapter 9). There are also e-payment solutions for e-commerce in which the payment and ordering processes have been integrated (see details in Chapter 9). The main development focus in the future will be on increased integration. This is because of the huge potential benefits for customers and the

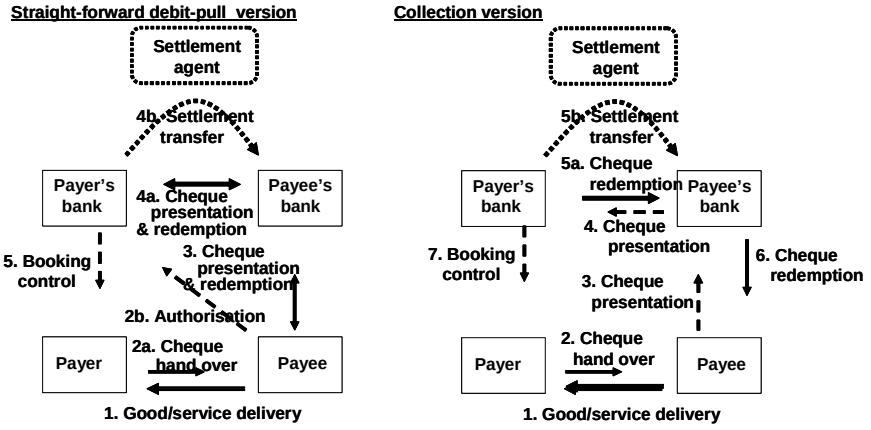
[10] See www.ecbs.org.
[11] See www.swift.com and www.europeanpaymentscouncil.eu.

improvements it will bring in bank services. The basis for increased end-to-end and customer-to-customer integration is the expansion of structured data content being transported by banks in a pass-through mode.

3.3 Developments in cheques

Cheques were the first form of debit pull instrument. The basic idea of the debit pull is that the payer gives the payee an instrument via which the payee can collect payment on behalf of the payer and the rules/legislation governing the payment instrument ensure the payee will receive the funds in the near future. With a debit pull instrument the payee initiates the payment with the banking system. The cheque process can be a straightforward debit pull whereby the payee's bank debits the payer's bank for the cheque, or a collection process in which the cheque is presented for collection and the accepted cheque is then honoured via a credit transfer (push) process. In order to increase the acceptance of cheques, banks have provided cheque guarantees according to specific rules and limitations. To reduce the risk of cheque fraud, banks have created authorisation services to ensure and reserve customer funds. Special fixed-amount cheque instruments (travellers' cheques) have been developed for travellers. The basic cheque processing patterns are presented in Figure 3.4. Because of the considerable number of cheques that cannot be honoured or accepted, banks have had to create well-defined routines for returning non-accepted cheques. Generally, cheques are considered inefficient instruments and have in many countries been replaced by more efficient debit pull instruments, ie is direct debits or card payments.

Figure 3.4 **The cheque payment process**



The cheque instrument is recognised in international legislation, and the rights and obligations of the participants in the process are clearly defined. There are international conventions for cross-border cheque transfers and message standards for international cheque transfers. International cheques are most often exchanged via correspondent banking relationships based technically on SWIFT cheque-processing messages. Cheques are outside the scope of SEPA arrangements.

Costs. Cheques are basically old-fashioned paper-based payment instruments. Legally, they are primarily bearer instruments. Especially in countries with high cheque volumes this has triggered moves to make the paper processes more efficient via automated sorting systems. However, complete transportation of the paper cheque through the whole chain is very expensive. Cheque truncation by archiving them at the payees' banks has considerably reduced interbank processing costs. Some countries have also introduced scanning of cheques at source, after which they can be transported digitally as images. In order to facilitate electronification of interbank transfers, cheques have been provided with optically or magnetically readable data fields. Automated interbank processing also requires an efficient account numbering/addressing convention, and these have so far been developed only at the national level.

Speed. In the paper-based cheque process, processing speed was dependent on the physical transportation distances and processing patterns. The delivery speed was often five or six days, resulting in a long extra float period, which payers often regard as an extended

payment period. Electronic processing made it possible to reduce delivery times to one to three days in a batch processing environment, depending on the frequency of the batch cycles and the need for physical transportation of data media. However, current telecommunication services enable real-time processing, which is used for all remaining cheques in Finland, for example. Banks generally have an interest in reducing processing times in order to reduce credit and fraud risks.

Security. There are more risks in the cheque process than with credit transfers. The payee's identity and right to the account is not subject to any outside verification. The payee is in possession of the payment instrument before its presentation to the bank. Fraudulent payers and fraudulent payees (merchants) are therefore a typical security risk. Payers can also easily write cheques without cover. The payee's bank often takes a credit risk vis-à-vis the payee by redeeming the cheque before interbank settlement is secured. The payer's bank takes a credit risk vis-à-vis the payee's bank if cheque transactions can be debited from its interbank settlement account before the genuineness of the cheque and the availability of payer's funds are verified. These risks have led to the development of several risk mitigation methods. Cheques are printed using security printing features. Customer identity is verified using identity documents or special cheque cards (eg the Eurocheque card used in Europe). Payees are requested to make special identity an authorisation checks. Cheques can be limited to account-based redemption only. Alternatively, they can be processed as a collection item, which ensures payer's funds and reduces the risk of fraudulent cheques being redeemed. The security methods used for cheques are rather expensive, which increases the costs and reduces the competitive efficiency of this payment instrument.

Interfaces. The design of paper-based cheques generally follows national standards; no international standards are available. Cheques can contain magnetic or optical data in order to facilitate efficient data input. Electronic cheques have been developed in some countries, but these are generally either payment instruments of card or credit-transfer type, although they have been called electronic cheques in order to make it easier to market these solutions to old cheque customers.

Integration. The cheque number is normally the only available integration feature in cheques that allow the payer to check bookings.

There is no remittance information for receivables reconciliation, and this has to be found from some attached document. The risk of fraud and mistakes means the payer needs to check the cheque bookings more thoroughly than credit transfer bookings: eg no changes to the value of the cheque and no extra, fraudulent cheques.

3.4 Developments in direct debits

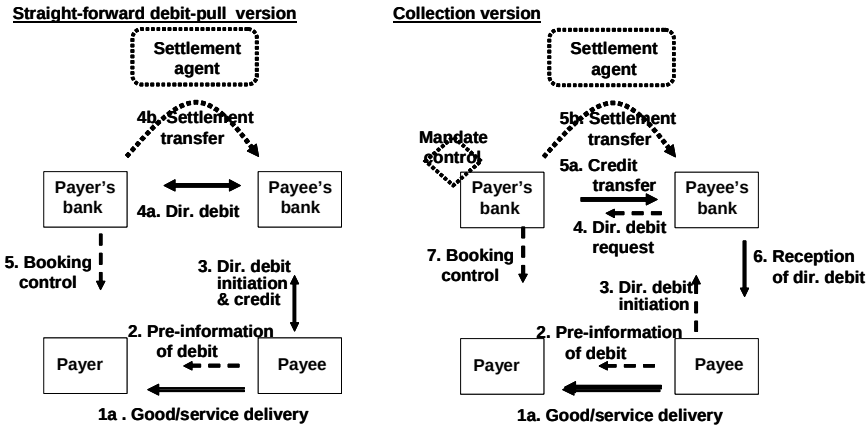
Although in use earlier, direct debits have become more widespread since the 1970s. The basic improvement the direct debit instrument brought to the debit pull process was that corporate customers had the payment information available in their IT systems and could efficiently transfer it from there into their bank's payment processes. It is mainly used for recurrent payments to large creditors such as public utilities, insurance companies and newspapers. Direct debits have developed for national use and there are no international standards. Due to the national nature of developments, existing direct debit processes vary considerably in their design. The legal basis also varies. Direct debits rely on a mandate given by the payer to the payee giving the latter the right to debit the payer's account. Two main variants of payment process design are shown in Figure 3.5, and two main variants of the mandate process in Figure 3.6.

The straightforward debit-pull version resembles the cheque process, but the cheque has been replaced by a mandate form, which the payer gives directly to the payee. The payee sends the direct debit initiation transaction to his bank, which will forward it to the payer's bank for debiting. The payee is generally requested to inform the payer some days in advance about a direct debit by sending a separate notification or invoice. In the simplest version of this design the payee is credited for all transactions directly and interbank settlement is also carried out for all transactions. This design is quite open to fraud and insufficient funds and is thereby subject to different kinds of risks. There can be fraudulent payers who give wrong account numbers. There can be fraudulent payees who send transactions without any corresponding deliveries or with the wrong amounts. Banks, therefore, generally grant payers the right to reject direct debits after they have, as customers, received their account statement and had time to check the debit bookings. Another possible risk is insufficient funds on the payer's account. All of these situations require a good returned/rejected debit process to be put in place. During any delay in the return/rejection process, banks are exposed to credit risks, and they

therefore need to have systems in place, especially against fraudulent payees.

Due to the large risks in the straightforward debit-pull version a more secure collection version has been created in many countries as the next step in development. In this design, the mandates are presented to the payer's bank, which can thereby verify the identity of the payer. Secure systems also allow the payer to define limits on the debits, eg total amount and number of transactions to be debited by a named payee in a given time period. The payer's bank then checks all direct debit transactions against the mandate information. In the more secure variant, the direct debits are also processed as collection items, ie only after acceptance by the payer's bank is the transaction transformed into a credit transfer for interbank settlement and for crediting to the payee. The collection model efficiently reduces credit risk and most other risks

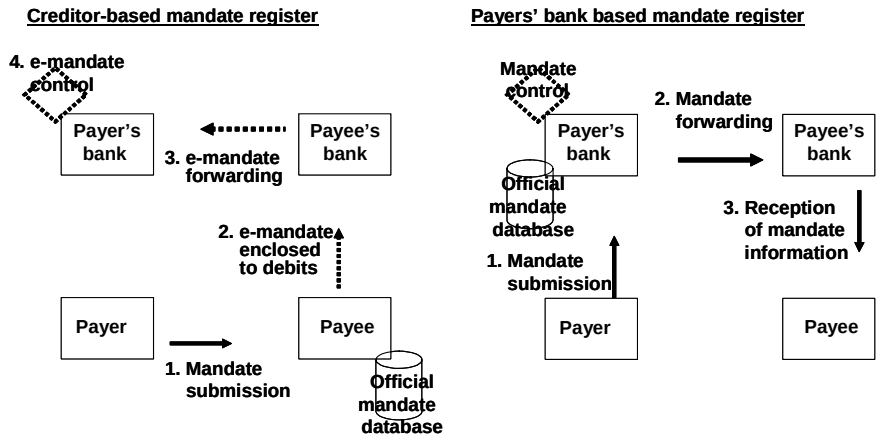
Figure 3.5 **Direct debit processing alternatives**



The mandate is an essential part of the direct debit process. In the creditor-based mandate design each creditor collects and archives the mandates. In cases of fraud the banks can request the payee to provide the original mandates. An improved version of the creditor-based mandate process is the use of electronic mandates with electronic signatures that are sent enclosed with each direct debit transaction, or via a separate e-mandate process to the payer's bank. This gives a secure way for the payer's bank to ensure that the payer has provided the payee with the necessary mandate. There is a current proposal to enhance the SEPA direct debit process with an e-mandate flow and e-mandating may therefore be available for customer use in late 2009.

The alternative mandate based on the payer's bank has developed in order to decrease the risks and improve the efficiency of direct debits. The payer's bank is in a better position to authenticate the mandate and ensure it is still in force and debits are carried out according to the payer's wishes. The distribution of mandates via banks is also more efficient, as each creditor does not need to have a collection and archiving process, and with increasing use of e-banking the payers can manage the mandates themselves via the Internet. In situations of change – payers changing bank, creditors merging, system updates etc – it is more efficient to keep the mandates centrally in the banks' registers. In order to manage the process, banks have in most national systems created a direct creditor register, which can also be used for marketing purposes.

Figure 3.6 **The mandate processing alternatives**



The similarities of the debit-pull methods can be seen in the German 'one-off' card-based direct debit schemes. In these, the transactions are verified using bank cards that are read using EFTPOS (electronic fund transfer at point of sale) terminals at the merchants, but are processed in the banks' direct debit systems (compared with standard German card payments, these lack the payment guarantee).

There are currently almost no international direct debit services. There are also no international standards for direct debit transfers. This is partly due to the varying national standards, little business interest and security issues, which are more easy to manage at national level. Within the SEPA context, an international direct debit scheme is under preparation and is planned to be available from late 2009.

Costs. Direct debits have been a good method for reducing banks' and corporate customers' payment costs via electronification. Consumers generally save, too, as the efficiency of direct debit payments is also reflected in payment charges. Another convenient benefit for payers is that the process removes the need for manual work such as keying in payment data for an alternative credit transfer. Direct debits have been an efficient method for reducing paper-based payments. In order to function, direct debits require a standardised account numbering system, and IBAN will provide the solution for international routing. The declining trend in ICT costs will decrease the costs of direct debits, as these are almost completely automated both between banks and between banks and corporate customers. Bank-to-customer integration via e-banking has reduced costs both in bank service networks and for corporate customers.

Speed. Right from the start, direct debits have had a high level of electronification. Banks have also wanted to provide incentives for corporate customers to adopt direct debits, which has resulted in quite speedy processing, with less float involved than in credit transfers. The delivery speed is generally one or two days. In order to be competitive, direct debits will probably eventually have the same delivery times as credit transfers, or may even be slightly faster before immediate real-time bookings will become the norm.

Security. The security of direct debits has been a concern that has limited their use initially to only very trustworthy payees/creditors. Improved bank-based mandate registers have increased security considerably, and electronic signatures will provide new opportunities in the future.

Interfaces. Payees/creditors have from the start used electronic interfaces by sending standardised messages using magnetic tapes and network connections etc. E-banking has now provided payers with the possibility to receive and reject direct debits electronically. The same electronic interfaces have also been available for bank-based debtor mandates, both for payers' mandate initiation and payees' mandate reception. Cross-border usage will demand international standards. XML 20022 developments can be copied for direct debit transactions, as the data content is the same for credit transfers and direct debits. The mandates would need a separate standard for the necessary messages between banks and customers.

Integration. The bank account number is generally used in direct debits for identifying both payers' and payees' payment accounts. European developments are clearly pointing towards the use of standardised IBANs. The basic tool for payee integration has been the reference number, which allows payees to automatically update both successful and unsuccessful/rejected direct debits. In order to manage mandate flows, creditor reference data is needed, eg phone numbers for TELCOs, insurance policy numbers for insurance companies etc. It can also be the reference number used in previous payments. A new level of integration has been reached with the introduction of e-invoicing, which is used in, for example, Norway and Finland. With e-invoicing, the payee does not need to send out any special paper-based notifications to the payer, instead sending the direct debit transactions including an e-invoice to his bank, which forwards the transaction including the e-invoice to the payer's bank for presentation to the payer. The payer, especially when a corporate customer, can then receive the information in electronic format for processing with STP in internal accounting systems. For private payers, banks can provide an easily browsed e-archive of direct debits and e-invoices. (See special section on e-invoicing in Chapter 9.)

3.5 Developments in card payments

The essential improvements card payments provide over other debit-pull instruments are the improved interfaces and security that cards have introduced. Compared with cheques, cards can be seen as permanent reusable cheques with electronic interfaces. Compared with direct debits, cards introduce improved features for secure customer identification, and especially one-off transaction initiation. Efficient self-service interfaces for vending machines etc have also been developed for cards. However, card payments are still prone to fraud, and payers therefore have considerable room to reject payments made with their cards. They therefore need to check their account statements thoroughly for fraudulent payments.

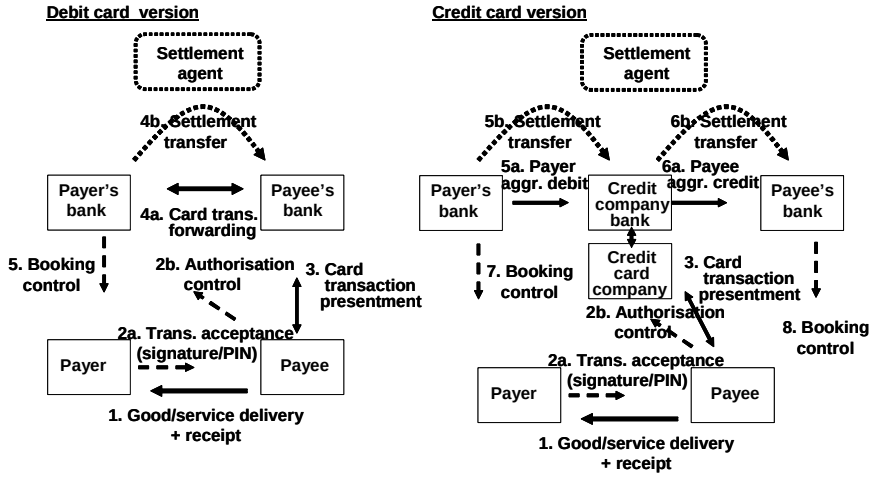
Compared with the other payment instruments, card payments show some distinctive special features: international branding, a well-standardised physical instrument (card), efficient international account numbering system, efficient international message standards, international processing networks, a high level of bundling with credit services (credit cards) and general card service conventions, but also limited usage possibilities (mainly merchant payments only and not,

for example, consumer-to-consumer payments). These developments are mainly due to banks' policy for developing an efficient international payment instrument. Cards are currently the only truly standardised, widely used international payment instruments.

The use of cards is limited to paying merchants in shops and remotely (eg over the phone or the Internet). Card payment accounts cannot generally be used for credit transfers based on card conventions, although this has been under discussion for some time and a number of trials have been launched. An efficient account and card numbering system is in place for cards, but this cannot be used for other payment instruments. Card transaction processing centres in most cases specialise in card payments, while there are other infrastructures for the other payment instruments.

Within card payments, two quite distinctive account structures and service types have developed: debit cards and credit cards. With debit cards, payers' bank accounts are debited directly and merchants' bank accounts are credited directly. With credit cards, a special credit card company mostly issues the cards and provides credit to payers, which increases the parties in the basic model four-party model to a six-party model. The credit card company uses a bank for debiting the payers through credit transfers or direct debits for the aggregated payment balance. This is most often the sum of the credit card payments in the preceding month. Thus, the most common credit period averages 45 days, as settlement of the credit on any given month needs to be settled by the end of the next month. The credit card company credits the merchant/payee for the aggregated card payments of all its customers for a given day via a credit transfer some days later. Merchants often experience a considerable negative float in credit card credits. There are also hybrid versions of these two 'pure' versions, for example credit card services provided by banks in which the functions of a credit card company can be found within the banks. (See Figure 3.7.)

Figure 3.7 **The card payment process**



Costs. Card payments are viewed as one of the most efficient of the current payments. The costs compared with cash and cheques are lower for all parties and are in line with direct debits (see Chapter 5 for details). However, from the merchant's point of view, the cost efficiency is often lost due to high merchant fees and service bundling, especially for credit cards (see Chapter 6 for details). Merchant float can also be large, due to delayed credits. The standardised cards and, most often, standardised card terminals (EFTPOS = electronic fund transfer at point of sale) make the service efficient. Card technology also supports different kinds of vending machines and brings an efficient alternative to cash. Compared with credit transfers, debit card transactions have an additional authorisation control leg in order to ensure funds and reduce fraud. Fraud costs have been a clear problem, and one that will be considerably reduced by the new chip cards. The credit card process is a more complex, two-phased process in which the credit bookings are done first and the final payments by the payer and to the payee are made later as batch payments for several original card transactions.

Speed. In order to reduce risks, online processing has become more common for all kinds of card payments, and especially for authorisations of high-value transactions or fraud-prone locations. Banks have an interest in speeding up account debits. However, the account credits to merchants are often made with considerable delay, which is dependent on local market practices.

Security. Fraud related especially to credit cards has been internationally large compared with other instruments. There are, however, big differences nationally. Credit card fraud can be categorized in three major types: abuse of the credit line, use of stolen cards and direct forgeries. Abuse of the credit line depends partly on the credit line criteria being too loose, and partly on a lack of adequate verification. Stolen cards can easily be used until the customer reports the theft and the card is blocked. Customer liability for reporting thefts and for transactions made before reporting has often been seen as a regulatory consumer protection issue. Fraudulent card numbers have been particularly commonly used for Internet payments, in which it is very difficult to trace criminals. Various modern security techniques have been tried in an attempt to solve the Internet payment problems, but none of these is yet in widespread public use, as they often require cardholders to have specific hardware solutions like, for example, chip card readers. The change-over from magnetic stripe cards to EMV (standardised Eurocard-Mastercard-Visa) chip cards is well under way. These new cards will replace the current magnetic stripe cards, which are easy to copy, with more tamper-resistant cards. Forgeries should decrease considerably, or even disappear for chip cards.

Interfaces. Specific point-of-sale terminals are already being used by a large proportion of merchants. However, most terminals employ national standards, as truly international EFTPOS standards are lacking. One of the SEPA development targets is to provide and introduce Europe-wide EFTPOS standards. Merchants would also benefit from common transaction reporting and booking conventions and interfaces so that reconciling of card sales would become more efficient. Private customers would also welcome common statements of account, especially when they get used to electronic statements. To use EMV cards for secure Internet payments they would need a low-cost contact-based or contactless interface with their PC. One interface gaining more and more interest is the mobile phone, for which there are a large number of trials for mobile-based card payments (see more in Chapters 3.6 and 8).

Integration. Merchants require two types of integration in order to automate their processes to their normal point-of-sale equipment and to their bank account reconciling systems. Both require proper interfaces for transporting the data. For efficient reconciling, the systems of the acquirer should carry a reconciling code from the EFTPOS terminal to the merchant’s bank account statements. This

would allow establishment of a clear connection between the shipped transaction lots and the booking entries on the account statements, including reports on unaccepted and returned transactions. Cardholders would benefit from increased transaction information, and in fact from a complete e-invoice or e-receipt giving detailed information about purchases made. The e-invoices/e-receipts should use the same standards as for other payments, which would produce a common e-archive for all e-payments. When cardholders have accepted the transactions at their PC or by using their mobile phone, they have already accepted the payment and the acceptance information can be stored for automatic reconciling of the e-statement of account produced by the bank. In order to avoid the need for double checking already accepted payments, the information stored in the mobile phone or in the customer PC could be used for automated reconciling (see Chapter 9 for details).

3.6 Developments in Internet and mobile payments

E- and m-payments have been 'hype' issues for some time now. New entrants and non-bank competitors, in particular, have been eager to provide these new payment types. However, these are not basically new methods of payment, simply electronic versions of the traditional payment methods. The e/m-functions make it easier to initiate and control payments independently of time and place. Credit transfers can easily be made using PCs or mobiles. The payment card information in the magnetic stripe or chip of the traditional card can also be stored in a secure part of the PC or mobile. The basic difference from traditional payments services is that these are completely electronised and can be efficiently integrated with customers' own systems. There is currently a difference between e- and m-payments due to the bandwidth restrictions in mobile networks. However, this difference will rapidly disappear once mobile 3G-services and handsets become popular. 3G already brings sufficient bandwidth for normal payments, and the 3.5G and 4G versions that are already on the drawing board will provide ample capacity for even the most advanced services (for technical details see Chapter 8).

Costs. The costs for processing Internet and mobile payments are shrinking rapidly, while the manual service costs for traditional payments are at the same time strongly increasing. The volume shift

towards e/m-payments will increase the cost difference, which is already now at least ten fold to the advantage of e/m-versions.

Speed. True Internet and mobile payments will be processed in real-time, and customers will therefore get an immediate final confirmation or rejection of any e- or m-payment. Compared with traditional payments, e/m-payments have a clear speed advantage.

Security. The challenge of e- and m-payments is to securely identify the payer. These payments are initiated remotely with no possibility of physical identification. The customer has to have some kind of tamper-resistant security device that cannot be used by others or forged. For example PCs are very open processing environments with viruses and Trojan horses that can 'spy' on customers' identification codes and seize the PC for making additional payments without the customer realising it. These security problems need to be resolved before e/m-payments become widely used. Biometrical identification solutions will also be needed to ensure customer identification.

Interfaces. PCs and mobiles provide a large range of technical interfaces, which are increasingly becoming wireless for PCs as well. They are becoming faster and more reliable, with readymade payment solutions like RFID technology (see chapter on technology developments.) The basic advantage of e- and m-payments is that all kind of data input will be made automatically. Customers just need to make simple selections and acceptations in addition to inputting PIN or other passwords. All transactions data can be easily browsed from the system.

Integration. Complete electronification makes it possible to integrate e/m-payments with all adjacent business process. Payment can be closely integrated with ordering or invoicing. The debiting control process can also be steered by preset acceptance parameters, and active acceptance is only needed for high-value or otherwise special payments. Standardised account chart information will make it possible to book accounting entries automatically. Banks' statements of account will become direct and automated general ledger input.

3.7 Summary of payment instrument developments

Payment instruments will probably converge towards two basic instruments: payer- and payee-initiated payments using a common set of messages and data fields and based on standardised customer identification and security features.

For payer-initiated payments, there is currently only one basic option, the credit transfer. This situation will continue to prevail, as the credit transfer is a very straightforward and simple process. However, in order to support customer end-to-end integration it will carry more data than before. To initiate a remote credit transfer, the payer's bank must be able to identify its customer, but can use bank-specific solutions provided for the customer. In the long run, however, a general customer identification method will emerge that can be used by all customers for all banks (see Chapters 8 and 9 for details on technology and service developments).

For payee-initiated payments (or actually payee-presented payments, as the payer has in most cases given an initiating acceptance to the payee for starting the payment process) there are currently several parallel options: cheques, card payments, direct debits and different kinds of e- and m-payments, including e-invoicing via the bank systems. These have developed over time due to three special requirements: payer identification, utilisation of the ICT capabilities of corporate payees for payment initiation, and the legal rules for debiting another customer's account. Cheques have disappeared from general consumer use in most countries and have been replaced by card payments. Cards, and especially chip-based EMV cards, provide tamper- resistant customer identification capabilities. Due to the future total, immediate and continuous mobile communication connectivity, the probable outcome over time is that these current debit pull instruments will convert to credit push instruments, in which the payer's account is first debited before the payee's account is credited. This will considerably decrease the risk of fraudulent transactions and will enable the process to be streamlined with credit transfer processes. When total connectivity is in place payers can authorize all transactions directly to their bank using the identification and authorisation device supplied by the bank. The debit pull process designed for off-line cheques and cards will not be needed, as the payee will receive a final credit immediately.

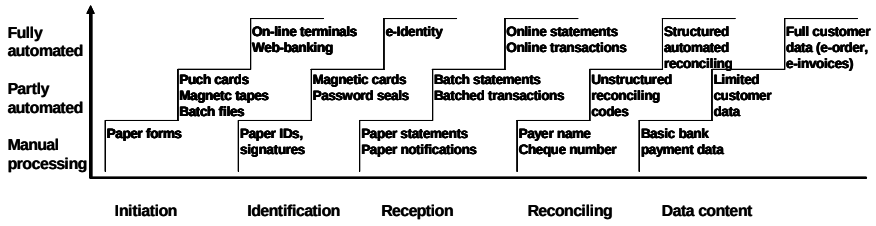
Interfaces will converge towards international standards in the same way as ICT and mobile telephone standards. There are no

special benefits in maintaining national standards. All payments contain the same basic data, and with practically limitless data storage and communication resources there is no need to try to save by leaving out some data elements that are important to some users.

Payments will be integrated with business processes because of the clear benefits to all parties. The ‘pay before’ process can be combined for synergies with the e-ordering process, and the ‘pay after’ process can be combined with the e-invoicing process. The ‘pay now’ process can be combined with both e-ordering and e-invoicing, and banks could also provide a delivery-versus-payment functionality for the ‘pay now’ situation. In order to achieve full integration, ie end-to-end straight-through processing, all messages will need to have identifiers or references by which these can be matched and reconciled.

Although the ultimate outcome is clearly visible, the timing of developments is hard to predict, ie what will happen in the near timeframe of 2010 to 2015, and what will only happen after that. This will be partly determined by technical developments, but mainly by the speed of interbank cooperation or new competitors to the traditional service providers. A more detailed analysis will be presented in the Chapter 10.

Figure 3.8. **General steps of development**



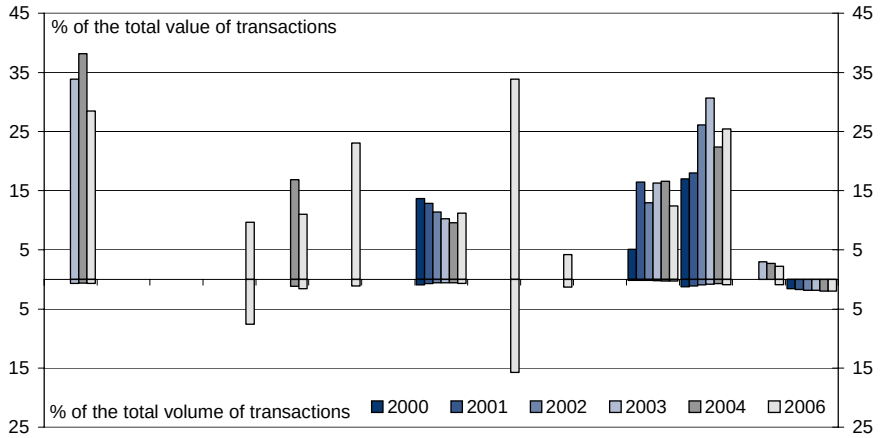
The general steps of development in payment instruments are described in Figure 3.8. These have followed a stepwise evolution from manual processing, via partly automated solutions, to complete automation. It seems that we are heading towards a state of automated completeness after which developments will naturally slow down. At the fully automated level all payments are initiated, processed and notified electronically in real-time and include all necessary customer and bank data in standardised format for automated reconciling and customer processing. The interface to payments will be developed for user convenience. However, as paying is a very simple process where the essential components are ‘to whom’, ‘from whom’, ‘why’ and ‘how much’, the electronic interface can be quite simple, especially

when a good general e-identification system is in use. Customers will probably find the increased data content and e-archiving services to be the most interesting new features.

4 Statistical trends and developments

The development of payment volumes is tied to general economic developments, as payments are always connected to the economic transactions behind them. However, we can see clear differences in the development of different instruments. Payments are mostly local transfers, and in almost all EU countries the market share of cross-border payments in volumes is well below 3% (see Figure 4.1). In all countries, the market share in value is higher than the volume share, which suggests cross-border payments are on average much larger than domestic payments. One explanation for this is that most exporters currently use local collection accounts in order to speed up cross-border collections. In value share, Finland is clearly the leading country, with a market share close to 25%, while most other countries reporting these figures show between 10% and 20%. The main bulk of cross-border payments are card payments partly related to tourism or import/export-related credit transfers.

Figure 4.1 **Market shares of cross-border payments in value and volumes, compared to total payments EU15, 2000–2006**
(only available for some countries)



Source: ECB, Blue Book publications.

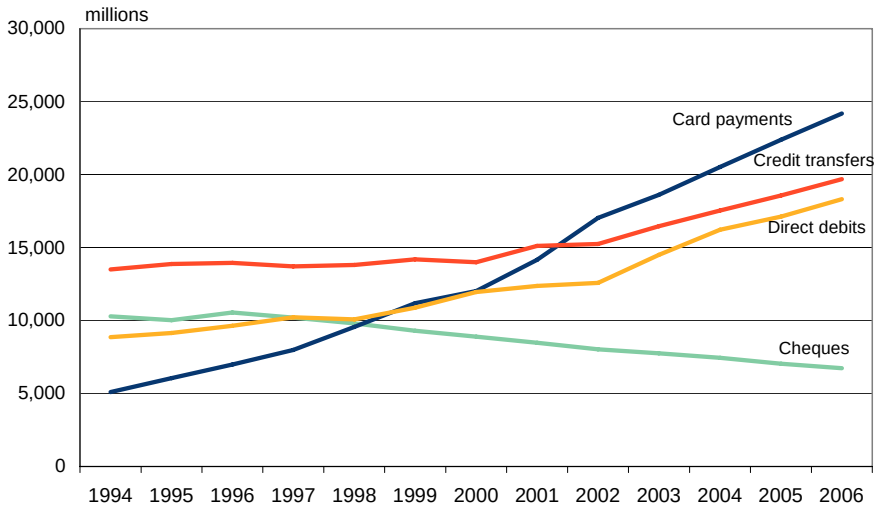
Because of the strong domestic character of payment habits, payment instruments and their use vary considerably, and different national payment conventions have emerged depending on the marketing of services, availability of instruments, local differences in efficiency, official preferences, etc.

The statistical analysis in this chapter starts with some general European developments and continues by reviewing each payment instrument according to a common pattern (number of transactions per capita and relative importance in volume and value). The focus is on European developments in the EU (15) area, with a special emphasis on SEPA developments and comparisons from a Finnish point of view. This limitation has been necessary in order to keep the figures readable and the data sets manageable. Where possible, the time series encompass 1994 to 2005, but in some cases data can be lacking. It should also be noted that data collection methodologies have differed somewhat across countries and have also changed during the period under review, which means the figures are not all completely comparable. Caution is therefore required, especially regarding cross-country comparisons. However, the analyses indicate clear general development trends for which the data is quite solid. The figures therefore provide a good general overview of developments and will hopefully encourage further, deeper studies and also efforts to align data collection methodologies.

4.1 General European statistical developments

When looking at the overall volume developments for different payment instruments, we can see some very clear trends (Figure 4.2). Card payments are today the most popular non-cash-based instruments and have shown strong and continuous annual growth of about 15% since 1994 in the region analysed. Credit transfers, which are the next most popular instrument, remained very stable until 2000, since when we can see sustained annual growth of around 4–5%. Direct debits have exhibited varying but continuous growth throughout the period, with the average at around 7%. After slight initial growth, cheques have declined steadily since 1996 at an average rate of around 4% per annum. If this trend does not accelerate, this inefficient instrument will still be in use for more than 15 years.

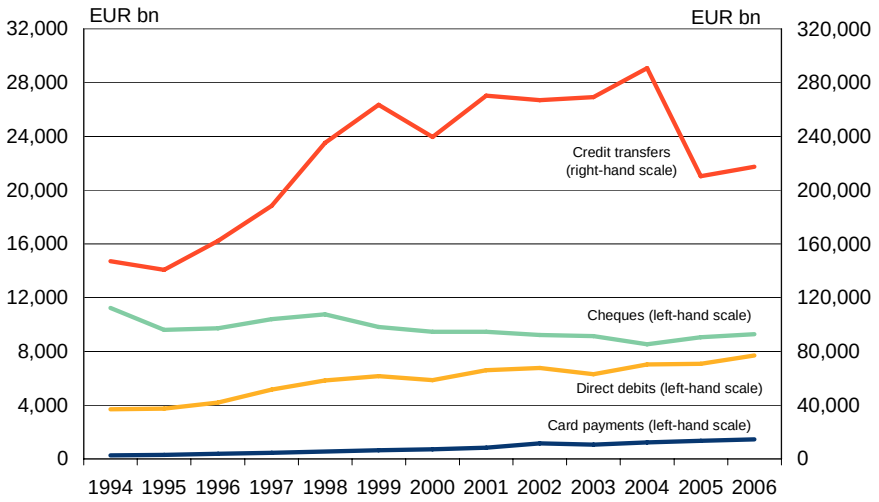
Figure 4.2 **Use of cashless payment instruments within the EU15, number of transactions**



Source: ECB, Blue Book publications.

The trends in transaction values are quite different from volume developments (see Figure 4.3). Credit transfers are by far the instrument with the largest turnover. There are some sudden jumps in the figures, but these are mostly explained by changes in statistical methodologies. The total value of cheques has decreased, but less than the volumes, which means that the average value of cheques has increased. The total values of direct debits and card payments have increased in line with their volume increases. Although the volume of card payments is large, the total value of card payments is small, due to their low average value.

Figure 4.3 **Use of cashless payment instruments within the EU15, value of transactions**



Source: ECB, Blue Book publications.

Table 4.1 contains the market shares of cashless instruments in 2006 and their average size. The average value of card payments is only EUR 61, resulting in a value share of just 1%, although the volume share is 35%. In contrast, credit transfers, with a volume share of 29%, have a value share of 92% due to a high average value of EUR 11,100. Direct debits have an average size of EUR 110, a value share of 3% and a volume share of 27%. Cheques still have a volume share of 10% and a value share of 4%.

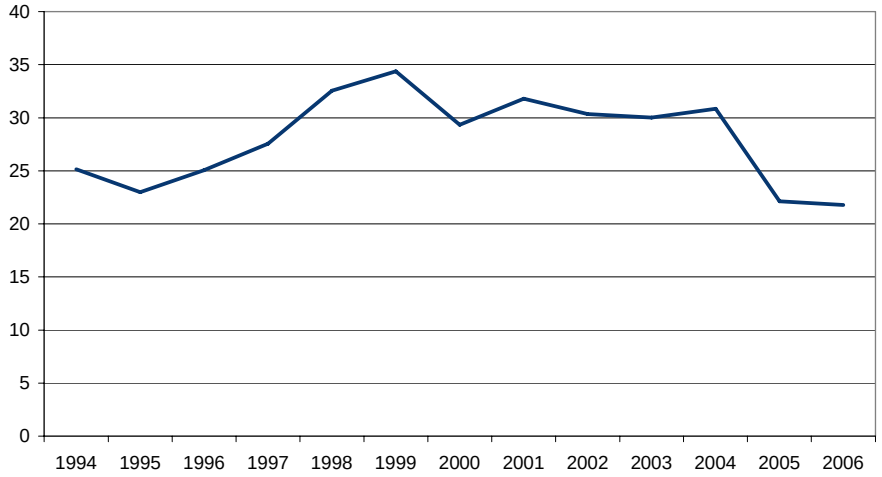
Table 4.1 **Market shares of cashless instruments in 2006**

Instrument	Volume share	Value share	Average size EUR
Card payments	35%	1%	61
Credit transfers	29%	92%	11,100
Direct debits	27%	3%	420
Cheques	10%	4%	1,380

When we compare the total value of cashless payments with GDP, we can see a rather stable curve with some fluctuations (Figure 4.4). (The down-turn at the end of the graph is probably partly due to changes in

data collection methodologies.) On average, payment systems transfer 30 times the value of GDP.

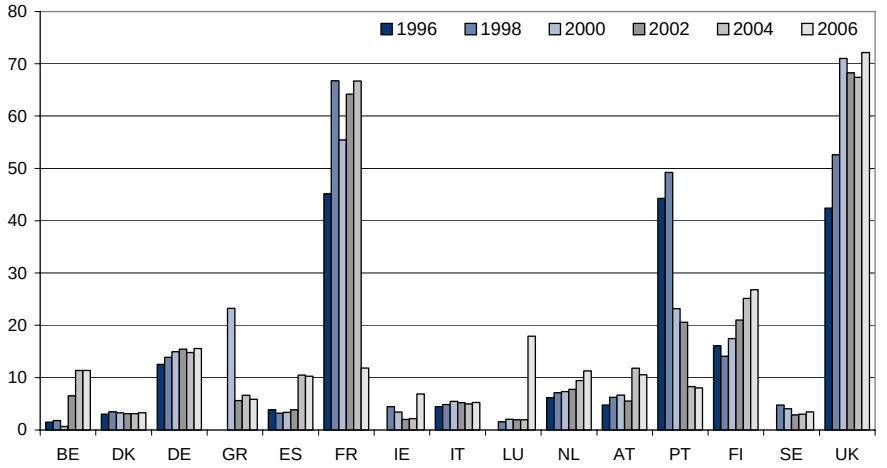
Figure 4.4 **Total value of cashless payments relative to GDP, EU15**



Source: ECB, Blue Book publications.

Figure 4.5 shows quite large differences in payment values relative to GDP, with Belgium, France and the United Kingdom reaching turnovers up to almost 70 times GDP, while Denmark, Greece, Ireland, Italy, Luxembourg, the Netherlands, Austria and Sweden have turnovers close to ten times GDP or much lower still. This cannot be due to differences in cash usage, as the differences are so large and countries with low cash usage also show low non-cash payment usage. The reasons probably lie in the size and functioning of investment markets (gross or net, and how many steps are involved) and in the general length of the delivery channels between primary producers and end consumers. The consolidation of production and delivery channels will reduce the need for external payments.

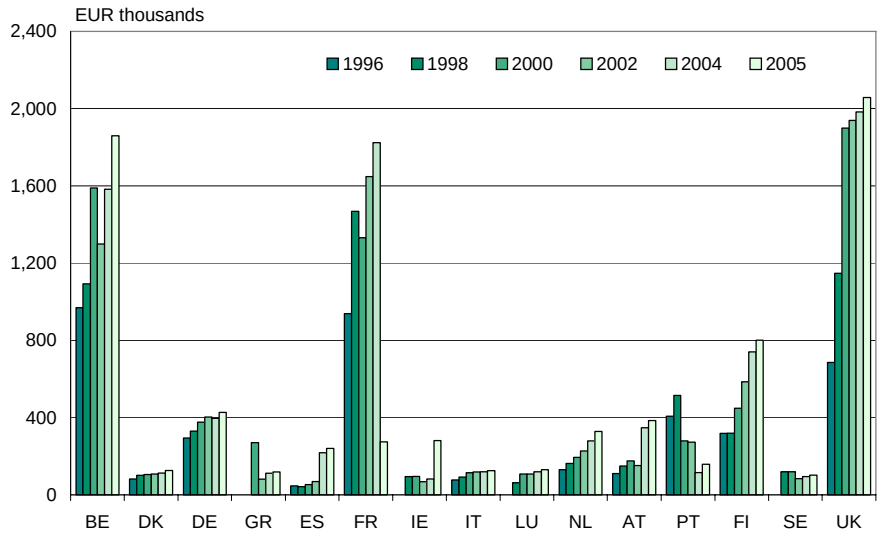
Figure 4.5 **National cashless payment value totals relative to GDP for EU15 countries**



Source: ECB, Blue Book publications.

The total value distributions of cashless payments per capita in the different EU15 countries (Figure 4.6) show the same pattern as the comparison with GDP. The same countries (Belgium, France and United Kingdom) stand out for their large turnovers, ie around EUR 2 million per person per year, but this is probably due to differences in data collection definitions or some specific wholesale payment arrangements, because it cannot be due to habitual differences in retail payments, as such differences are not so large between EU countries. Finland is the fourth country in this comparison, with per capita turnover of about EUR 0.8 million. The rest of the countries have a turnover of about EUR 150,000 to EUR 400,000 per capita per year. There is a clear growth trend in all countries except Portugal.

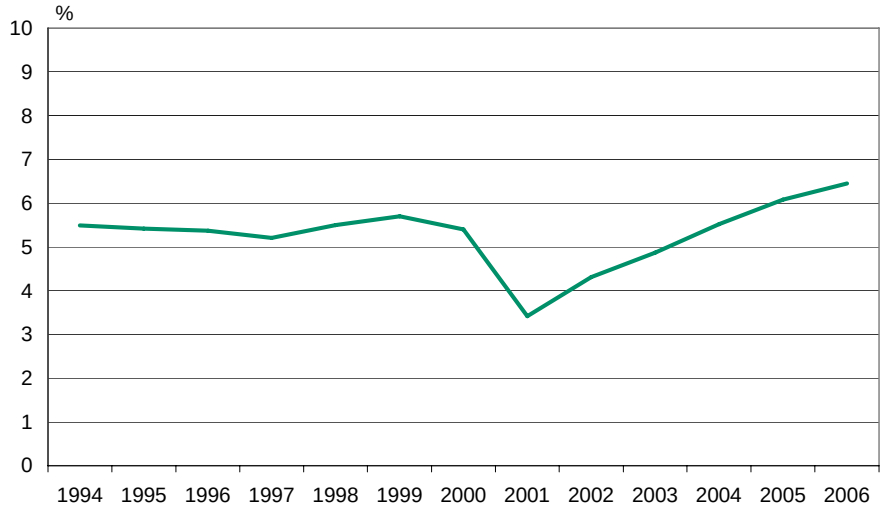
Figure 4.6 **National total values of cashless payments per capita for EU15 countries**



Source: ECB, Blue Book publications.

The total value of euro cash issued to the public is available and is depicted in Figure 4.7. The stock of cash in circulation issued by euro countries decreased drastically during the euro changeover at the end of 2001 and has since then increased continuously. The changeover forced hoarded and grey/black-market cash to be converted. The low value of 3.5% cash relative to GDP was therefore probably close to the general need of cash balances for normal payment transaction purposes. However, it is not possible to estimate the volume of cash payments in the euro area based on the stock of money. The stock of euros is expanding outside the euro area as the euro is a much larger international currency than all the previous national currencies combined. The velocity of cash balances is changing, and mainly slowing down, as customers move to other more efficient payment habits. However, the most probable customer response to the reduced number of cash payments will be to still keep the same average balance in their pockets as before, ie the balance will simply be replenished less frequently, with the average size of individual cash withdrawals remaining the same. The average size of withdrawal may actually increase in response to increased ATM cash withdrawal charges. A major difficulty is to estimate the grey and black market use of cash. The relative share of 'unaccountable' cash usage will grow as account-based payment volumes increase.

Figure 4.7 **Currency in circulation in euro area outside MFIs, value as percentage of GDP**



Source: ECB, Blue Book publications.

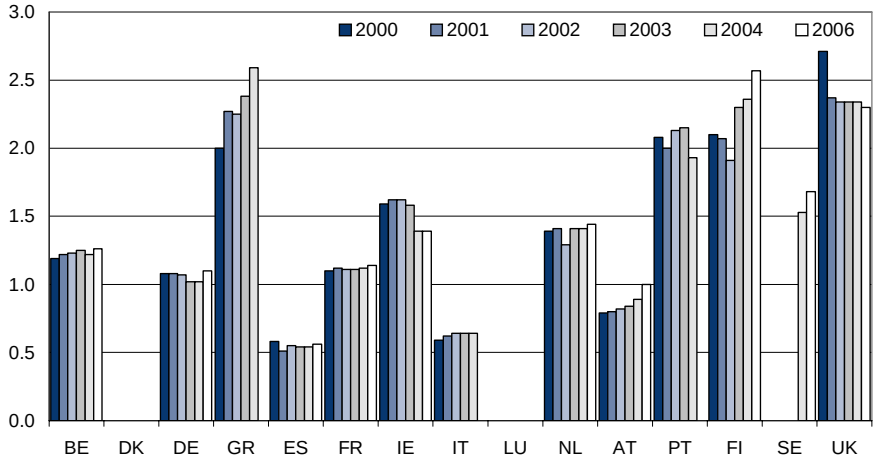
The overall increase in non-cash payments points towards a decrease in cash payments. However, there are no public statistics on cash payments for Europe as a whole. Anecdotal evidence points towards cash payment values in supermarkets being slightly under 30% in low-volume cash countries, and in the range of 50–60% in high-volume cash countries. Belgian value estimations made in 2003 give a 63% value share and an 81% transaction share for notes and coins at point of sale, while cash use in supermarkets is reported to take a 42% transaction share.[12] The corresponding study for the Dutch central bank estimates the cash transaction share at point of sale to be 85%.[13] In the study for Sweden's central bank the cash value share was reported to be 40%, and the share of transactions to be 70% in 2002.[14] The Finnish value share of cash transactions at EFTPOS was about 33% in 2006. These figures have probably declined somewhat since the studies were carried out.

The possibility to use cashless instruments depends on the number of 'banked' customers. The number of bank accounts per capita gives an estimation of banked customers. The statistics do not distinguish

[12] National Bank of Belgium (2006).
[13] Brits and Winder (2005).
[14] Bergman, Guiborg and Segendorf (2007).

between private customer and business customer accounts, but as the number of corporate customers is generally about 2–4% of the total number of customers, the estimation error due to this simplification is not very large, although corporate customers tend to have more parallel accounts than private customers. Private customers can also have parallel accounts for a variety of reasons, eg separate payment and deposit/investment accounts. In some countries, it can also be common for family members to share accounts. The ratio of deposit accounts per capita does, therefore, only give a rough estimate of average access to bank accounts. Figure 4.8 indicates considerable variation in the number of accounts per capita in the EU15 area. In high-density countries (eg United Kingdom, Finland and Portugal) there are close to two or more than two accounts on average per capita, while in low density countries (eg Italy and Spain) the average value is about 0.6 accounts per capita. In countries with quite a large share of unbanked inhabitants, a large proportion of salaries, taxes and other payments to or by most inhabitants are made in cash. One explanation for this could be that in these countries families more often than not share the use of their bank accounts via the head of the family instead of having individual accounts for each family member. Several countries (BE, GR, FR, NL, AT, FI and SE) show an increase in the number of accounts per capita over the period analysed, while some high density countries (IE, PT and UK) show a clear decrease.

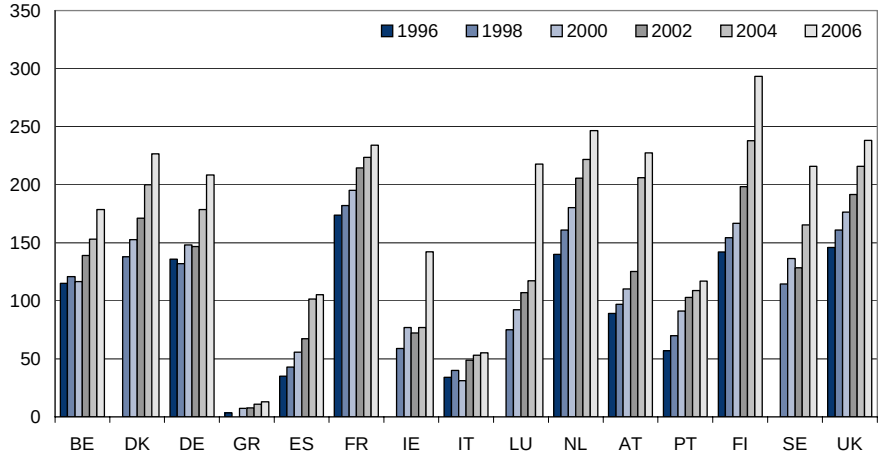
Figure 4.8 **Deposit accounts per capita in EU15 countries**



Source: ECB, Blue Book publications.

The total number of cashless payments per capita shows a clear growth trend in all countries during the period analysed (Figure 4.9). Finland stands out a little bit higher than the others, with about 260 transactions per capita per year. Most countries can be found in the bracket 100 to 250 transactions per year. The number of cashless payments can vary for structural reasons, such as how often mass services like public utilities and taxation items are paid. Greece and Italy stand out as countries with very few cashless transactions per capita.

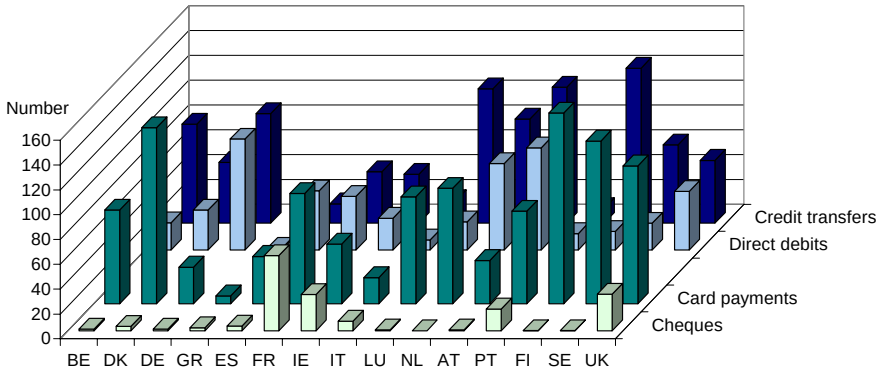
Figure 4.9 **Total number of cashless payments per capita per year in EU15 countries**



Source: ECB, Blue Book publications.

However, although the total numbers of cashless payments per capita showed only moderate variations with one or two exceptions, payment habits in respect of account-based instruments are quite heterogeneous across Europe, as shown in Figure 4.10. Cheques are still frequent payment instruments in some countries (FR, IE, PT and UK), while some countries are heavy users of credit transfers (BE, DE, AT, NL and FI). Direct debits are most popular in Germany and Austria, but a large share of these are card-based, one-off direct debits. Card payments are popular in the Benelux countries, the Nordic countries, France and the United Kingdom.

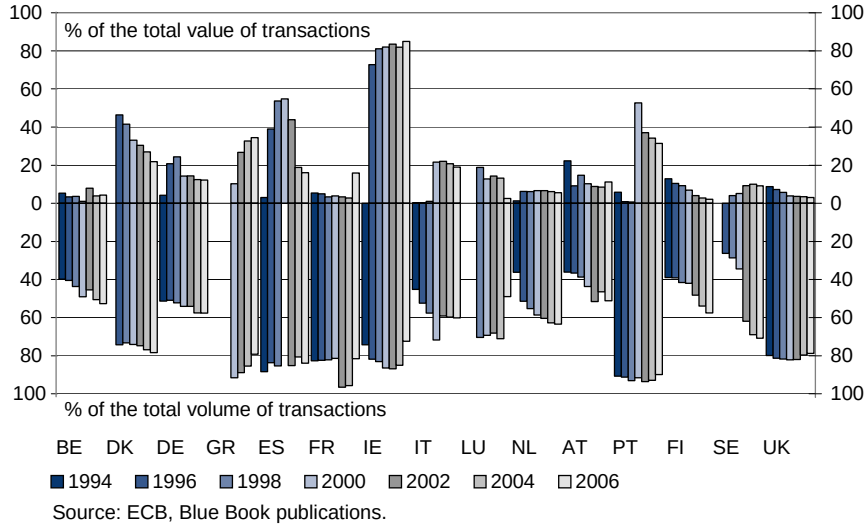
Figure 4.10 **Number of cashless payments per capita in EU15 countries, 2006**



Source: ECB, Blue Book publication.

One interesting overall development seen in Figure 4.11 is the decrease in the relative importance of debit instruments (ie cheques, direct debits and card payments) in value terms. The upper part of Figure 4.11 shows the national market shares in value and the lower part the market shares in volumes of debit instruments as against credit transfers. All countries besides Italy and Ireland show a clear decreasing trend in value (the figures for France are probably affected by a change in data collection methodology for 2005). Ireland is the only country where debit instruments have a larger market share than credit transfers in value terms. However, in numerical terms, the market share development for debit instruments is less homogenous. Several countries show a continuous relative increase in debit instrument usage. However, many show a decreasing trend towards the end of the period analysed.

Figure 4.11 **Relative importance of debit instruments 1994–2006**



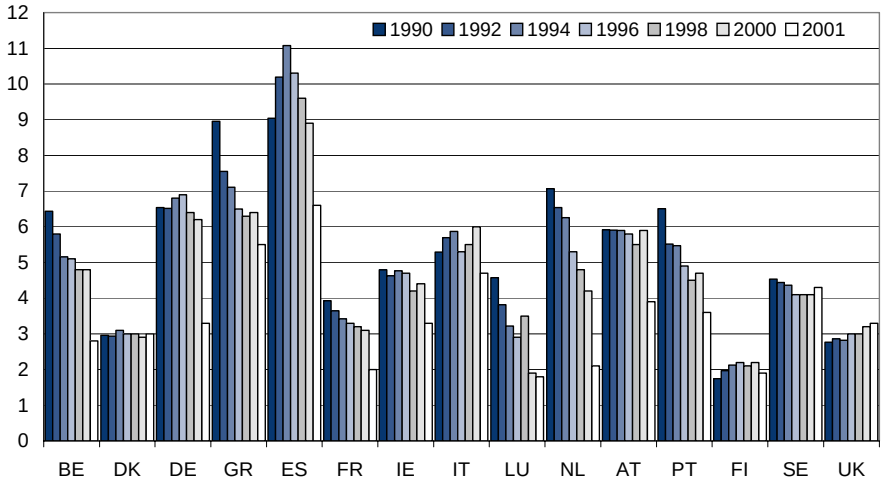
Source: ECB, Blue Book publications.

These differences among countries will be studied in more detail below, in the sections describing the development of individual instruments.

4.2 Cash statistics

Country-based statistics for the stock of cash is available for the euro countries until end of 2001, and the value relative to GDP is depicted in Figure 4.12.

Figure 4.12 **Cash outside MFIs relative to GDP 1990–2001**



Source: ECB, Blue Book publication.

There are large variations and also large changes in the stock of cash during the period analysed. Finland had the smallest stock of cash in use by the public. Luxembourg and France are also low-cash countries, and the reduction in cash in circulation due to the euro changeover brought them down to the same level as Finland, ie just under 2% of GDP. Denmark and the United Kingdom, too, have traditionally been low-cash countries but lack the typical euro conversion reduction as they retained their national currencies. Spain, in particular, but also Germany and Greece are countries with high cash usage.

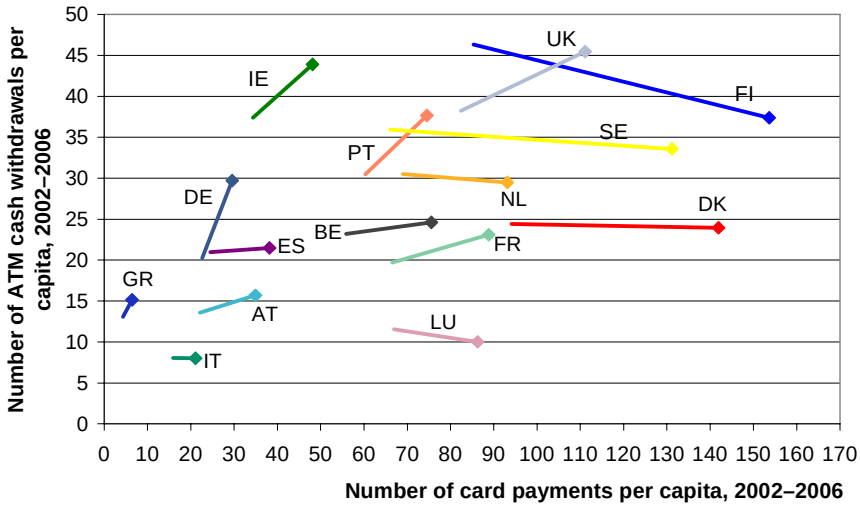
Table 4.2 **Banknotes and coins in circulation on 31 December 2007**

	In circulation million notes/coins	Volume share of notes	In circulation million EUR	Value share of notes
euro 500	453	4%	226,326	33%
euro 200	156	1%	31,137	5%
euro 100	1,209	10%	120,933	18%
euro 50	4,442	37%	222,112	33%
euro 20	2,468	20%	49,354	7%
euro 10	1,995	16%	19,655	3%
euro 5	1,421	12%	7,105	1%
Total notes	12,144	100%	676,622	100%
Total coins	75,814	624%	19,239	3%
Total cash	87,958		695,861	

According to number of notes, the euro 50 note is the most popular, with a 37% market share. Next is the euro 20 note, with a 20% market share. The euro 200 note is very little used. There are 6 times more coins in circulation than notes, but based on value the coins represent only about 3% of the total cash. In value, euro 50 and euro 500 notes both represent 33% of total value. Of the remaining third, euro 100 notes account for more than half of the value (18% share of total value). This also means that seignorage income[15] is divided in the same thirds. The euro 500 notes are seldom used for normal payments, generally being reserved for high-value cash payments.

[15] Notes and coins are interest free credits to the public that the central bank can invest and thereby receive interest. This interest income on issued cash is called seignorage.

Figure 4.13 **Cash withdrawals and card payments per capita 2002–2006**



Sources: ECB, Blue Book publications and author's estimate of ATM withdrawals in Denmark.

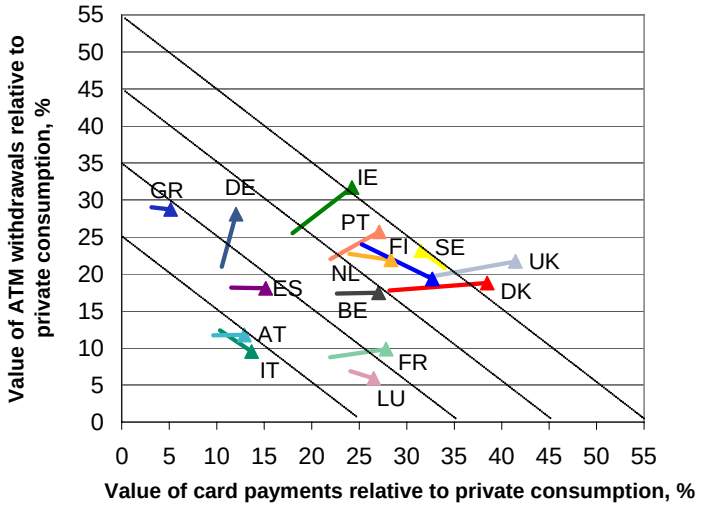
Cash withdrawals can be made in branches or via ATMs, but unfortunately there are only complete statistics available for ATM withdrawals. The Dutch central bank reports that counter withdrawals in 2004 represented 4.3% in volume and 19% in value of all withdrawals.[16] This kind of market share between over-the-counter and ATM withdrawals can probably be found in all countries where ATM withdrawals are popular. Payments at point of sale are mainly made using cash or cards. Figure 4.13 shows the developments of cash withdrawals at ATMs and card payments between 2002 and 2006. There is a clearly visible trend whereby ATM usage decreases when card payments reach more than 80 payments per person per year. All countries except France show a reduction in ATM volumes at this level. The Nordic countries are clear leaders in card payments, but with quite different ATM usage patterns. This is partly due to the different arrangements for cash backs at point of sale. Cash backs are rarely used in Finland, but are available to some extent in Sweden, while they are a regular service in Denmark, which is clearly affecting ATM usage in that country. ATM usage is still growing in countries with low card usage, and this is probably due mainly to the automation of branch services. Greece, Italy, Austria and (to some

[16] Bits and Winder (2005).

extent) Spain seem to be the countries where customers primarily use cash withdrawn from branches as their main payment instrument.

Figure 4.14 shows the value of ATM withdrawals and card payments in relation to private consumption. The highest automation levels with this measure can be found in Ireland, Sweden and the United Kingdom, where more than 55% of consumption is paid for using these instruments. Portugal, Denmark and Finland can be found in the 50–55% bracket. In contrast, in Austria, Italy, Luxembourg and Spain less than 35% of consumption is paid for by cards or cash withdrawn from ATMs. Decreasing ATM cash amounts relative to consumption can be found in Denmark, Finland, Italy and Luxembourg. Regarding this measure, it should be noted that credit transfers and direct debits are also used to pay for private consumption.

Figure 4.14 **Value of ATM cash withdrawals and card payments relative to private consumption, trends 2002–2006**



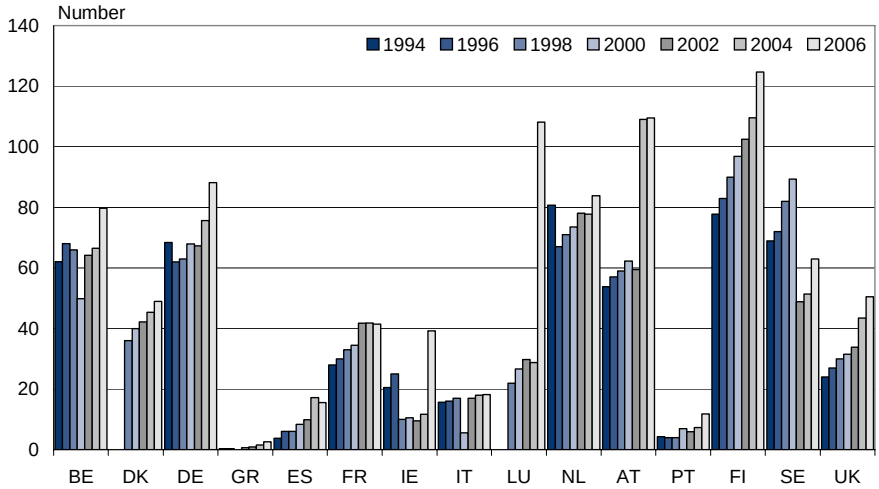
Sources: ECB, Blue Book publications, Eurostat and author's estimate for Denmark.

It would be interesting to have reliable statistics on cash withdrawals from bank branches in order to get a more complete picture of payment habits. In some countries, withdrawing cash at point of sale separately or as cash back is also used to some extent. The remainder of consumption payments are then made using cheques, direct debits or credit transfers (eg merchant credits paid once a month).

4.3 Credit transfer statistics

Credit transfers are by value the most popular instrument in all countries. However, the number of transactions varies considerably. Finland reaches almost 130 transactions per capita per year, followed by Austria and Luxemburg, both with about 110 transactions per capita per year. In contrast, Greece, Ireland, Italy and Spain show less than 20 transactions per capita per year. However, all countries show considerable and stable growth, as we can see from Figure 4.15.

Figure 4.15 **Number of credit transfers per capita 1994–2006**



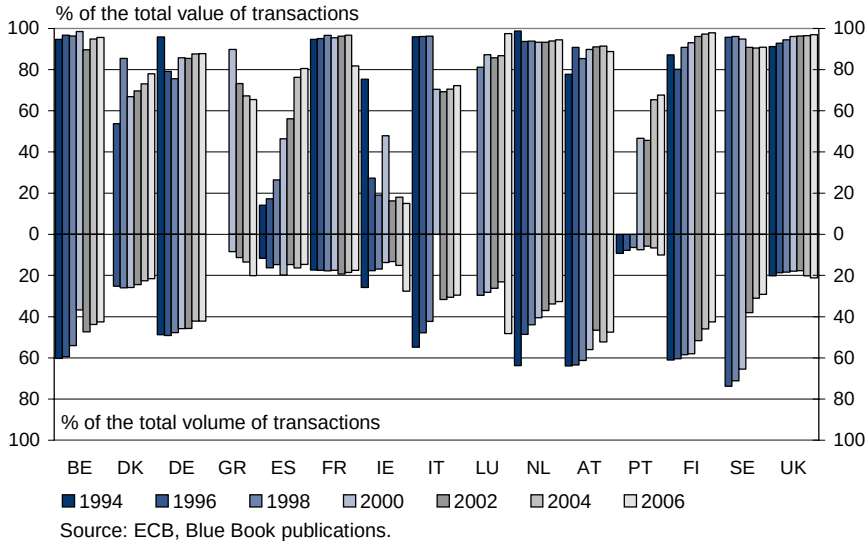
Source: ECB, Blue Book publications.

The upper part of Figure 4.16 shows the relative importance or market share of credit transfers compared with other account-based (non-cash) payment instruments. In most countries, credit transfers cover more than 80% of the total value of non-cash payments, with Ireland being a clear exception. The share of value has been rather stable or with a small increase except for Spain, which shows large continuous growth.

The relative importance of volumes (lower part of Figure 4.16) shows clear differences between countries, but also a clear decreasing trend in large volume countries, depending mostly on the rapid increase of card payments. Finland shows a market share in volume of 40%, together with Belgium and Germany, whereas in most other

countries the market share of credit transfer volumes is below 25%. With regard to value, the countries where credit transfers accounted for more than 90% of the transferred value in 2006 were Belgium, the Netherlands, Finland, Sweden and the United Kingdom. Ireland stands out clearly from the other countries, with the value indicator remaining below 20% in 2006, but with a clear growth in volume market share during 2006. Greece shows a decreasing trend in value, but an increasing trend in volume. The rest recorded values in the bracket 70–90%.

Figure 4.16 **Relative importance of credit transfers compared with other non-cash instruments 1994–2006**

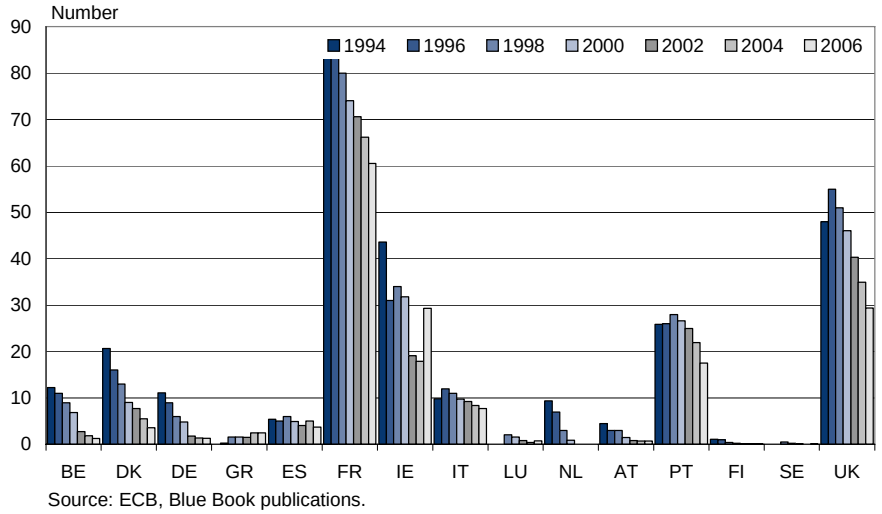


Source: ECB, Blue Book publications.

4.4 Cheque statistics

The number of cheques issued has decreased considerably in all countries during the period analysed. In most cases, the number of cheques has fallen below 5 per capita per year, and in the most advanced countries (Luxembourg, Sweden and Finland) below one cheque on average. However, in Ireland, Portugal, France and the United Kingdom the use of cheques is still quite substantial. Thus, in total, we are still writing almost 20 cheques on average per person per year in the EU15 region.

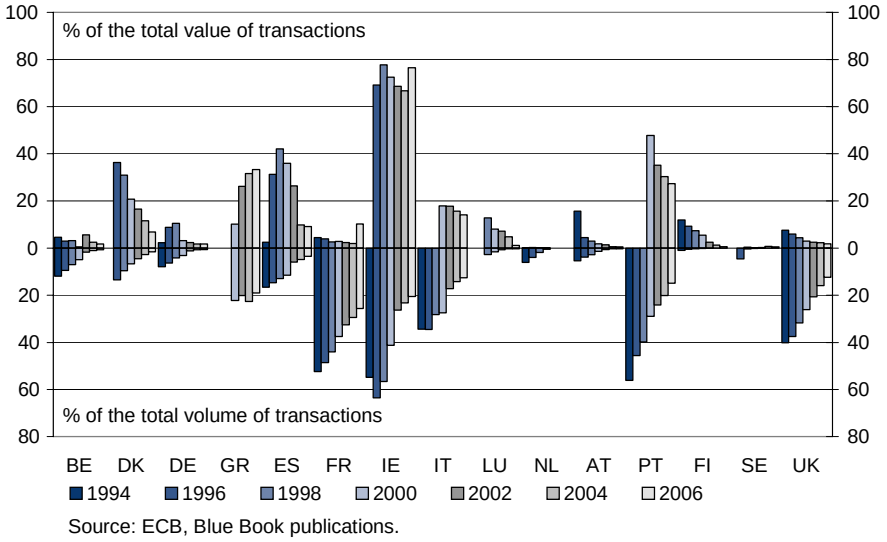
Figure 4.17 **Number of cheques per capita 1994–2006**



Source: ECB, Blue Book publications.

In terms of relative importance, the market share of value in cheques is much larger than the market share in numbers. The average value of the remaining cheques must therefore be rather high. The use of cheques has decreased in several countries to such a low level that it is almost invisible in the statistics for 2005 (Belgium, Germany, the Netherlands, Austria, Finland and Sweden). The remaining cheques are often used for special purposes: for example, in Finland cheques used as gifts for high school graduates account for more than 13% of the cheques still issued.

Figure 4.18 **Relative importance of cheques compared with other non-cash instruments 1994–2006**

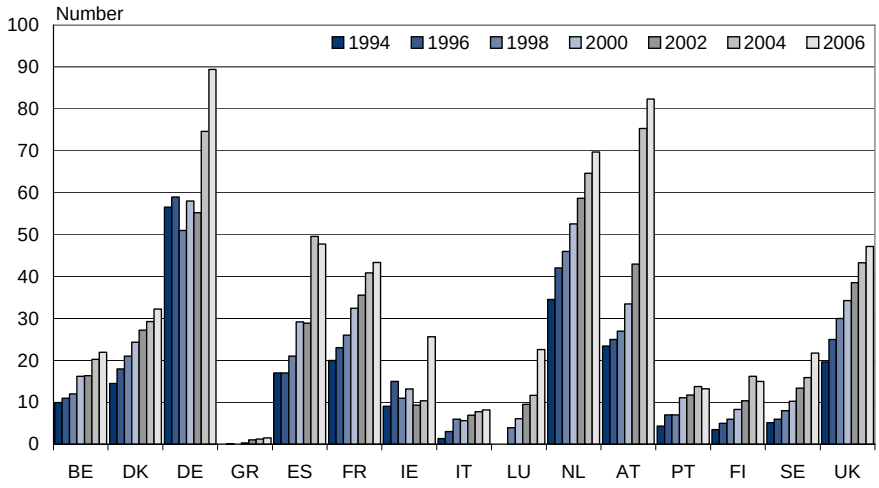


Source: ECB, Blue Book publications.

4.5 Direct debit statistics

The use of direct debits is growing rapidly in most EU15 countries, as we can see from Figure 4.19. However, the pace of growth has eased in many countries in recent years, and even turned into an absolute decline in some countries (eg France and Finland). Per capita use of direct debits is by far the highest in Austria and Germany. This is explained by the card-based 'one-off' direct debits used in these countries, where a bank card is used to verify the payment at an EFTPOS terminal and the transactions are processed like debit card transactions without a payment guarantee to merchants, but using the contractual arrangements for direct debits. In most other countries, these kinds of transaction are processed as debit card transactions, and traditional direct debits are used mainly for recurring payments of rents, mortgages, public utility services, instalment payments, etc. Other large direct debit countries are France, the Netherlands, Spain and the United Kingdom.

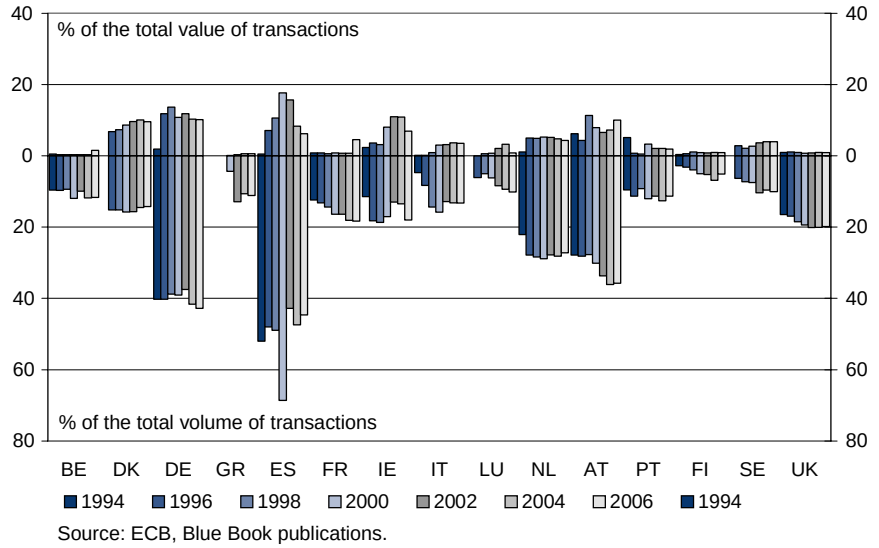
Figure 4.19 **Number of direct debits per capita 1994–2006**



Source: ECB, Blue Book publications.

From Figure 4.20 we can see that the size of direct debits is below the average size of payments in general. Direct debits are especially important in Spain, Germany, Austria and the Netherlands. Compared with other instruments, direct debits are becoming less important in almost all countries. The low usage and diminishing volumes are probably mostly explained by the contractual complexity of this instrument and banks' varying marketing efforts compared with the more straightforward credit transfers and debit card services. In the future, the introduction of e-invoicing will probably further reduce the popularity of direct debits.

Figure 4.20 **Relative importance of direct debits compared with other non-cash instruments 1994–2006**

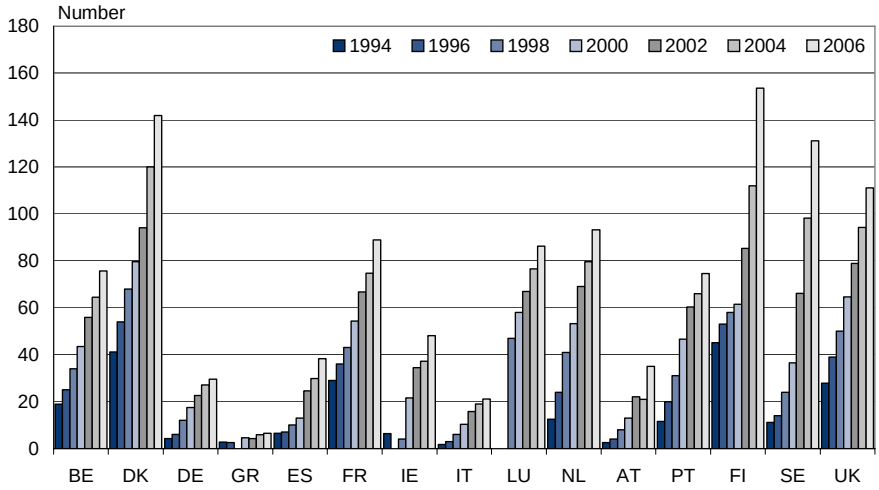


Source: ECB, Blue Book publications.

4.6 Card payment statistics

Card payments show a strong increase in number of transactions in all countries. Finland, Denmark, Sweden and the United Kingdom are the leading countries in card payments, where the inhabitants make on average more than 100 transactions per year. The use of cards is low in Greece, Italy, Spain, Germany and Austria. The German and Austrian situation is partly explained by the use of one-off card-based direct debits, and if these were codified as card transactions these countries would be around the middle of the scale for card use.

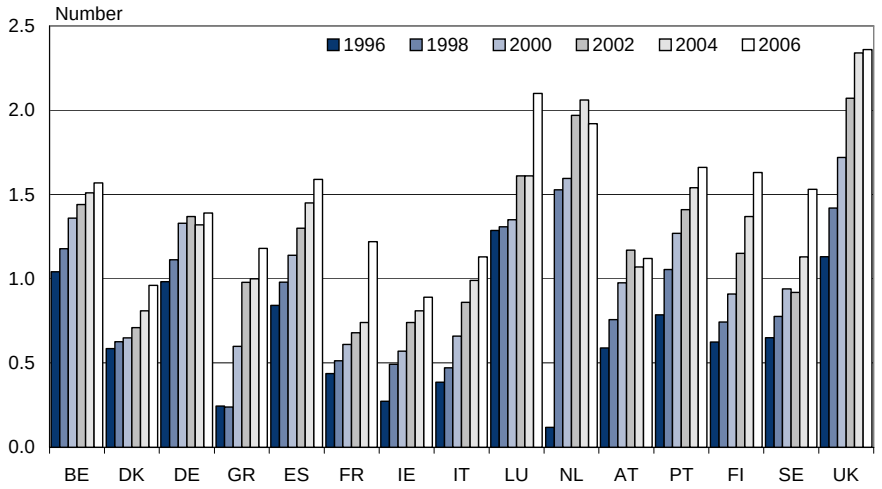
Figure 4.21 **Number of card payments per capita 1994–2006**



Source: ECB, Blue Book publications.

Card usage depends partly on the number of cards issued, as this generates merchant interest in accepting cards. The number of cards issued has grown throughout the period analysed, as we can see from Figure 4.22. The figure shows also quite significant differences across the EU15 countries. The United Kingdom is clearing the leading card-issuing country, with well over two cards per capita followed closely by the Netherlands and Portugal. Card density is below one card per capita only in Ireland and, surprisingly, Denmark, which is a high usage country. Per capita densities of a little over one card are found in Greece, Italy and Austria. The number of cards issued probably contains a large component of inactive cards in countries where there are no fees attached to cards.

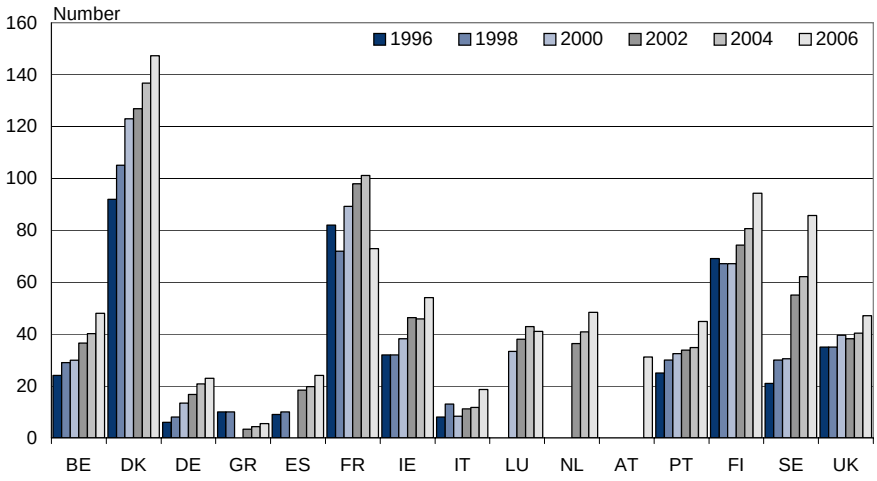
Figure 4.22 **Number of payment cards per capita 1996–2006**



Source: ECB, Blue Book publications.

Figure 4.23 shows the usage frequency of payment cards and reveals considerable differences. The cards issued are employed most efficiently in Denmark, with almost 140 payment transactions per card per year. Finland holds second place, with about 90 payments per card. In 2004, France had over a hundred payments per card, but the larger number of new cards issued in 2005/2006 reduced average usage per card. In general, transactions per card have increased in all countries throughout the period analysed.

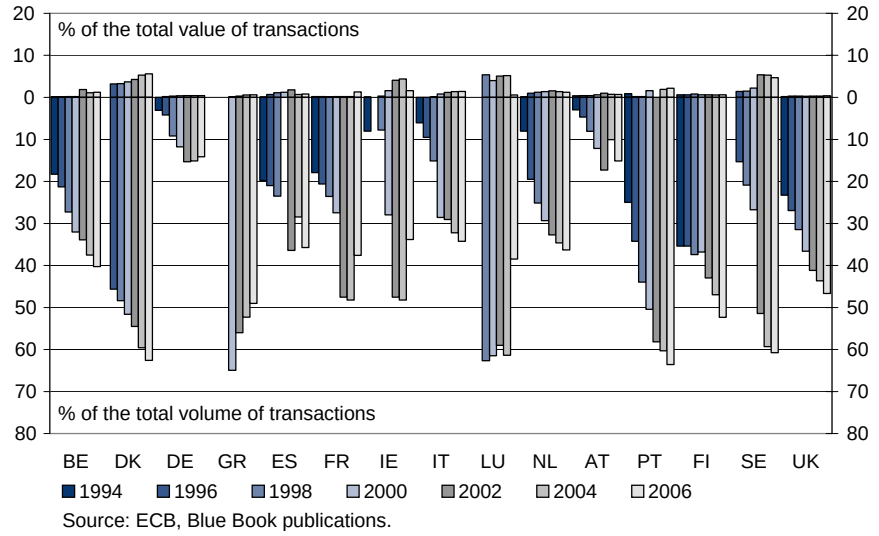
Figure 4.23 **Card usage frequency (payments per card per year) 1996–2006**



Source: ECB, Blue Book publications.

Even in countries where they are most important, card payments account for just 5% of the total value of payments. However, their market share in numbers is in several countries over 60%. The use of cards has in almost all countries grown throughout the period, with the clear exception of Greece. Countries reaching almost or over a 60% market share are Luxembourg, Portugal, Sweden and Denmark. Cards are clearly used for low-value payments, replacing cash in shops, etc.

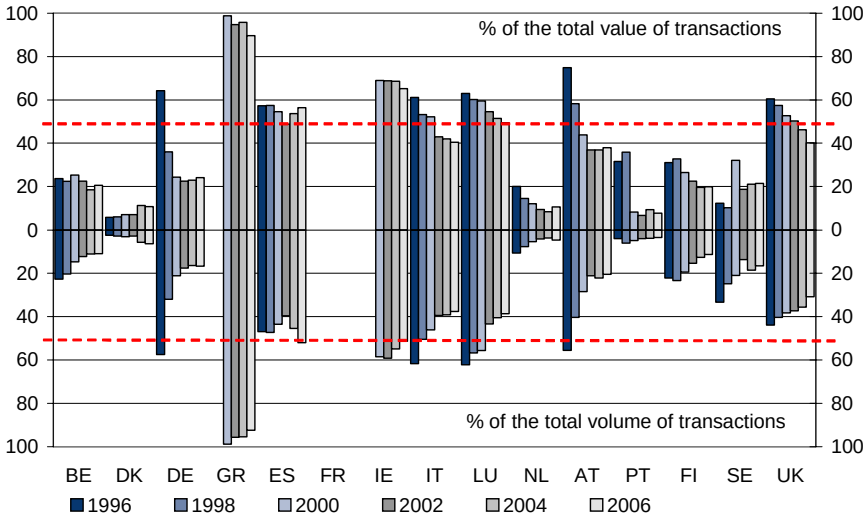
Figure 4.24 **Relative importance of card payments compared with other non-cash instruments 1994–2006**



Source: ECB, Blue Book publications.

Figure 4.25 shows the market share of credit cards versus debit cards, with all cards providing some form of credit included on the credit side; for example, the typical Visa and Mastercard deferred payment to the end of the next month. A bar reaching over the dotted red line (50% mark) denotes a larger use of credit cards than debit cards at point of sale. Figure 4.25 shows a clear increasing market share for debit cards in terms of both value and volume. However, there appears to be a recent trend during the last two years of an upturn in relative credit card usage in some countries (Belgium, Denmark, Germany, Spain and Netherlands) and a halt to the decreasing trend in others (Finland and Sweden), All countries except Spain and Ireland today have more debit card usage than credit card usage. In the case of Spain this is probably mostly due to the large proportion of international payments generated by tourists. Today, there are several countries with a market share below 20% in terms of volume for credit cards, namely Belgium, Denmark, Germany, the Netherlands, Austria, Portugal, Finland and Sweden. The figure also shows that the average purchase with a credit card is higher than with a debit card. This is especially true for countries with low credit card usage, where it seems that debit cards are used for daily purchases, while credit cards are predominantly used for larger, special purchases where credit is needed to fund the purchase.

Figure 4.25 **Credit card payments as a proportion of total card payment volumes**



Source: ECB, Blue Book publications.

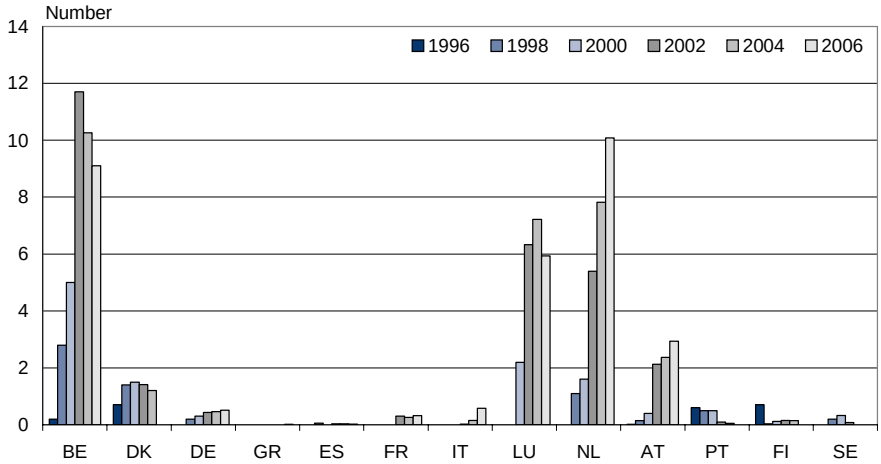
4.7 E- and m-money statistics

An interesting new development since the 1980s has been electronic money. There have been different forms of e-money on the market. Many of the first trials have been closed down. M-money/payment (mobile phone money/payment), meanwhile, is a new kind of payment instrument based on mobile telephone services, and trials of this kind have only begun since the turn of the millennium. There are as yet no major true m-payment schemes in Europe. (Paying via phone bills for calls made to specially charged telephone numbers are generally seen to be outside this payment instrument category, being viewed instead as some kind of billing service.) All of these instruments or payment methods are account-based and could also use normal deposit accounts as their booking accounts. Because these are new forms of payment instrument and the statistical methodologies/categories applied are not so harmonised and established, the statistics on these payment forms are more heterogeneous and cross-country comparisons need to be viewed with considerable caution.

The number of e-money transactions is reported for many EU15 countries. It is only in the Benelux countries where the number of transactions reaches over seven per capita per year, with Belgium as the leader with about 10 transactions per capita. Austria has more than

two transactions per capita, while Denmark has averaged more than one transaction per capita. Several countries, including Belgium, show a declining trend in recent years.

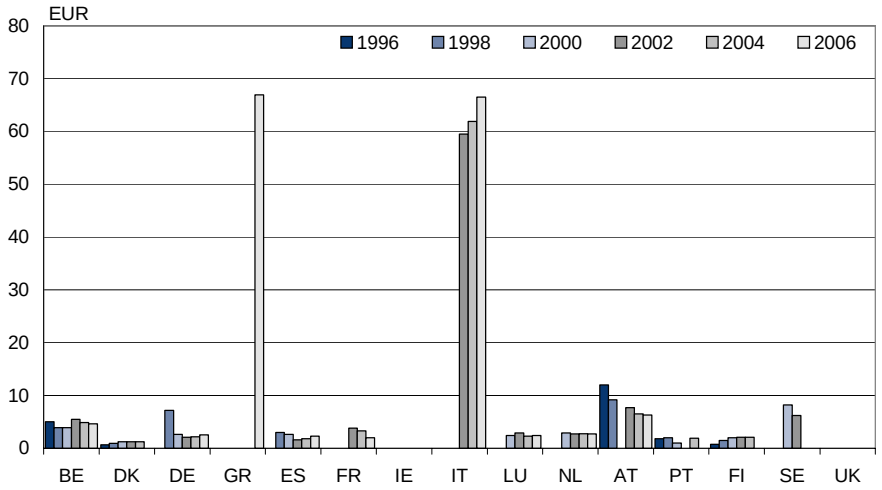
Figure 4.26 **Number of e-money purchases per capita**



Source: ECB, Blue Book publications.

E-money has been developed as a replacement for small cash purchases, and this is clearly reflected in the development of average transaction values in Figure 4.27. In all countries except Italy the average transaction values for e-money are well below ten euros, and in half the cases even below five euros. With an average transaction value of more than 60 euros, Greek and Italian e-money usage seems to be replacing high-value retail point-of-sale payments and other card-based payments more than small cash payments, as in other countries.

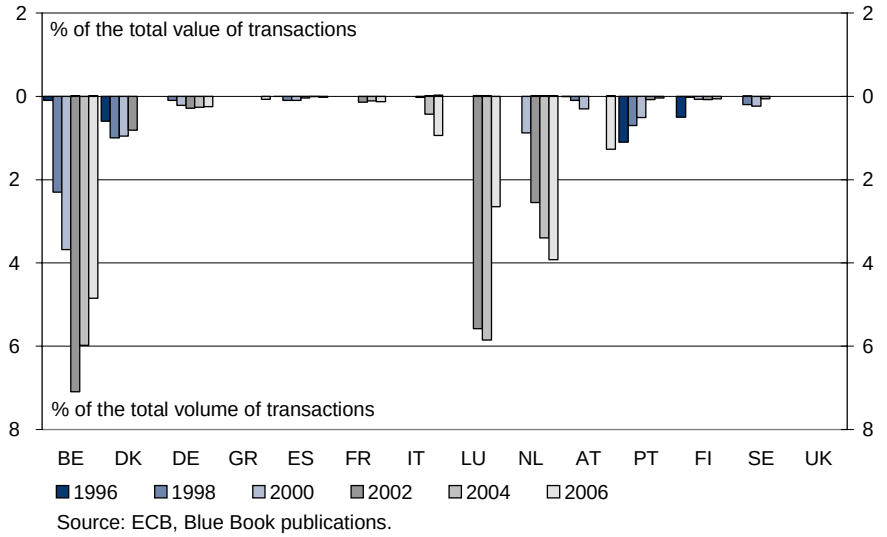
Figure 4.27 **Average e-money purchase values**



Source: ECB, Blue Book publications.

Due to the low volumes and average values, the value share of e-money payments is insignificant and the volume share is low, as we can see from Figure 4.28. The volume share has even decreased in all countries in recent years, with the exception of the Netherlands. It is only in the Benelux countries that the volume share of e-money payments is currently over 1%. Traditional payment instruments seem to win out over e-money and similar solutions. This is probably for technical, customer convenience and commercial reasons.

Figure 4.28 **The relative importance of e-money purchases**



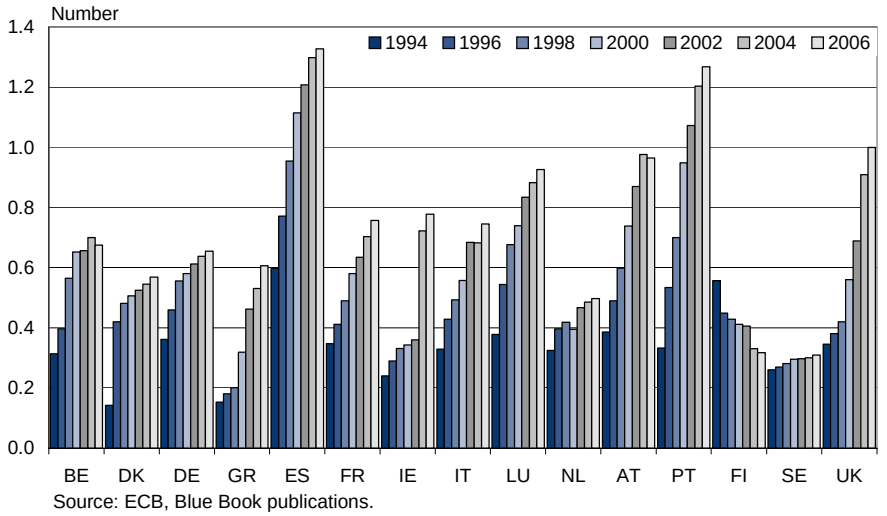
Source: ECB, Blue Book publications.

Unfortunately, there are no m-payment or m-money statistics publicly available on the European level. The volume at this point is very low in all countries. However, this will probably be a strongly developing area in the future (see Chapter 8) and it would therefore make sense to start collecting statistics at an early stage.

4.8 ATM statistics

ATMs are increasingly popular for withdrawing cash. Figure 4.29 shows the increasing number of ATMs per thousand inhabitants. However, in Finland the number of ATMs has decreased over the period as a whole, and a similar trend also seems to have started in Belgium 2005/2006. The major tourist countries, Spain and Portugal, have the highest ATM density in relation to population. The lowest densities can be found in Sweden, Finland and the Netherlands.

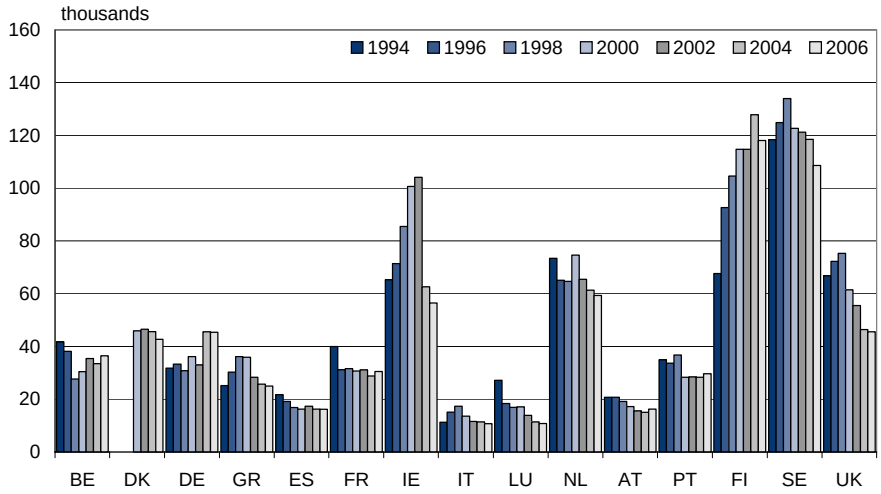
Figure 4.29 **Number of ATMs per thousand inhabitants**



Source: ECB, Blue Book publications.

There are three countries – Finland, Sweden and Ireland – with exceptionally high efficiency in ATM employment based on transactions per ATM, with on average more than 100,000 transactions per year per ATM. The lowest employment rates can be found in Spain, Italy, Luxembourg and Austria, where the number of transactions per ATM per year is below 20,000. The quite low rate of ATM usage in Denmark is explained by the frequent use of cash backs at EFTPOS terminals, which is a basic service of the national card scheme.

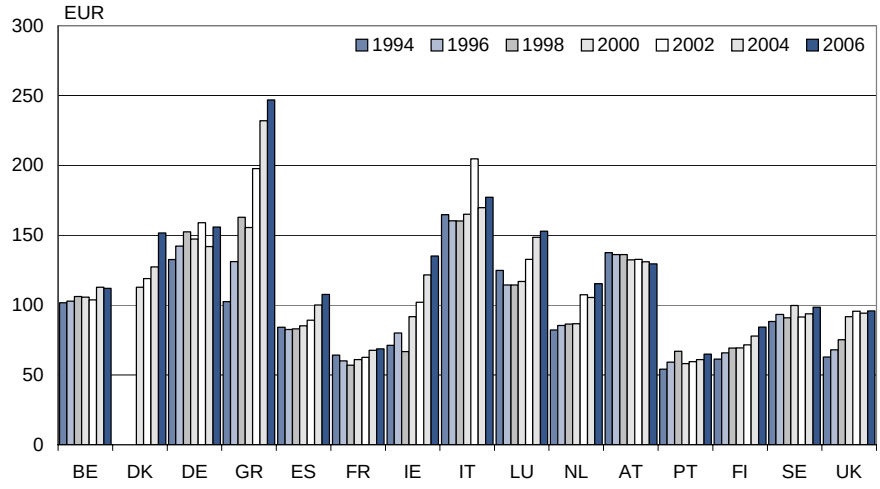
Figure 4.30 **Number of cash withdrawals per ATM 1994–2006**



Sources: ECB, Blue Book publications and author's estimate of ATM usage in Denmark.

The average value withdrawn per transaction has increased in most countries over the years, as we can see from Figure 4.31. Austria and the United Kingdom are exceptions. One reason for a trend above the inflation-based increase could be the introduction or increase of withdrawal charges in some countries.

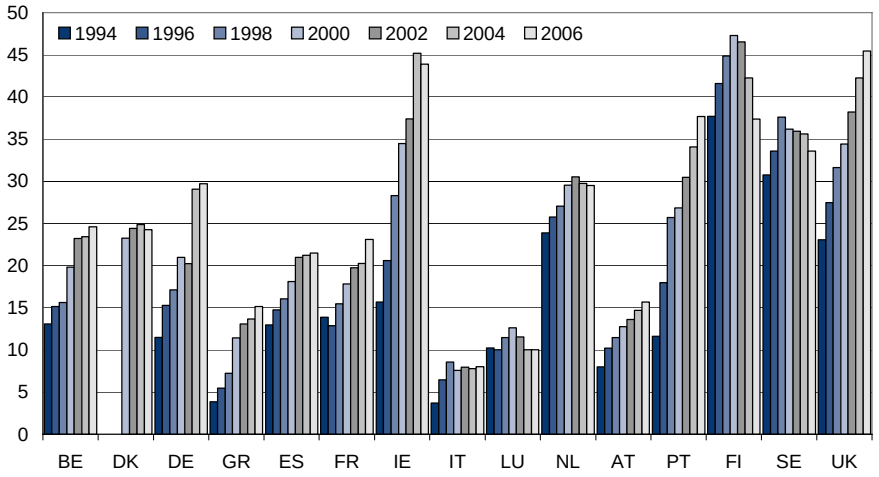
Figure 4.31 **Average size of cash withdrawal transactions**



Source: ECB, Blue Book publications.

The most frequent ATM users can be found in the United Kingdom and Ireland, where inhabitants make on average more than 40 withdrawals per year, followed by Finland and Sweden, with between 30 to 40 transactions per year. In Italy, Greece, Luxembourg and Austria, customers make less than 15 ATM withdrawals per year. The number of withdrawals was increasing in all countries in the early part of the period analysed, but more recent years have seen a turnaround in many countries (Denmark, Ireland, Luxembourg, Netherlands, Finland and Sweden). Increased used of cards for paying at point of sale and, probably, new fees on ATM services in some countries have reduced demand for cash withdrawals.

Figure 4.32 **Annual number of ATM cash withdrawals per capita 1994–2006**

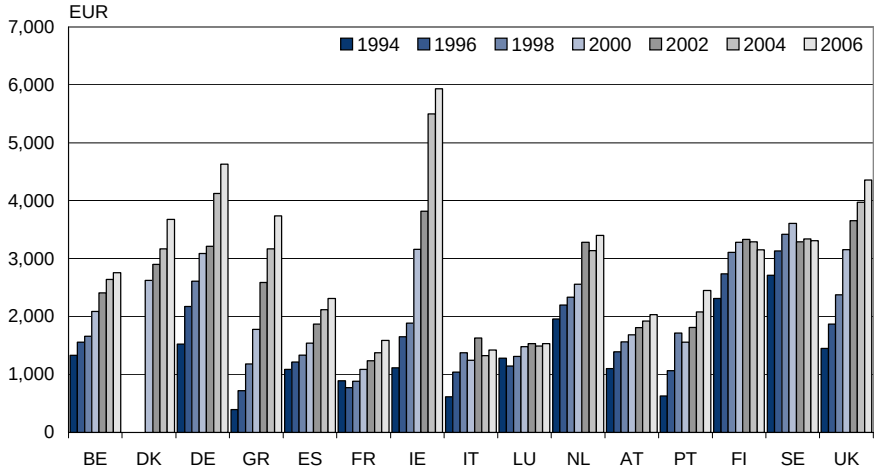


Sources: ECB, Blue Book publications and author's estimate of ATM usage in Denmark.

Irish customers are clear leaders in the total amount withdrawn from ATMs, at about EUR 6,900, followed by Germans, at about EUR 4,700. The lowest withdrawal amounts, under EUR 2,000 per year per capita, can be found in France, Italy, Luxembourg and Austria. The variations in average amounts across countries are smaller than the variations in average number of transactions, which means that the difference in numbers is partly compensated by a higher or lower average size of withdrawal. The average amount withdrawn does not show the same decreasing trend in recent years (except for Finland and Sweden), and, overall, the amounts withdrawn show more moderate growth than the transaction growth in earlier years. This would support the idea that the decreasing number of transactions is

due to changes in fee policies, and also partly to an increased length of queues at a decreasing number of ATMs, which are therefore used more heavily than before. In order to avoid queuing, customers make larger withdrawals. ATM networks are an expensive infrastructure, and the service is priced well below cost, or even provided free. Increased fees for these services could in future affect their use considerably.

Figure 4.33 **Average cash amount withdrawn from ATMs per capita per year 1994–2006**

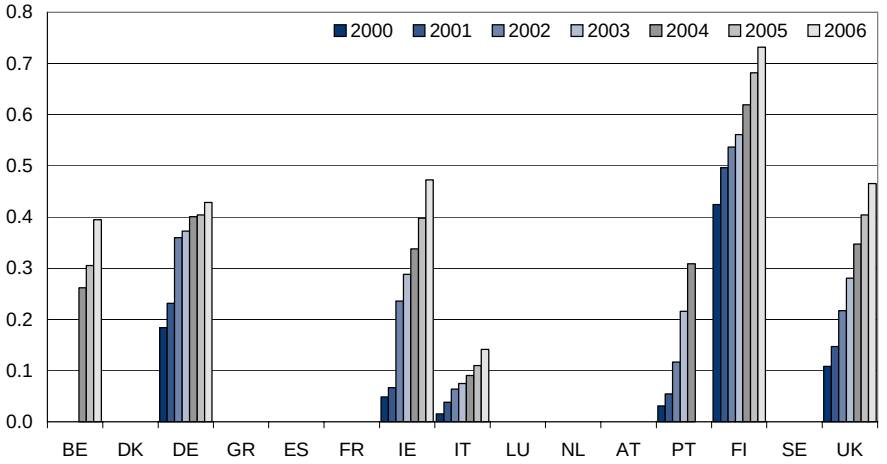


Sources: ECB, Blue Book publications and author's estimate of ATM usage in Denmark.

4.9 E-banking statistics

There are scarcely any public statistics on the use of e-banking. However, several counties publish the number of accounts linked to e-banking (Internet or PC), which is the basis for e-banking usage. According to Figure 4.34, Finland is the leading country, with more than 0.7 e-banking-linked accounts per capita. Ireland, the United Kingdom and Germany are all on the level of 0.4 e-banking accounts per capita. A clear and strong growth trend can be seen for all reporting countries.

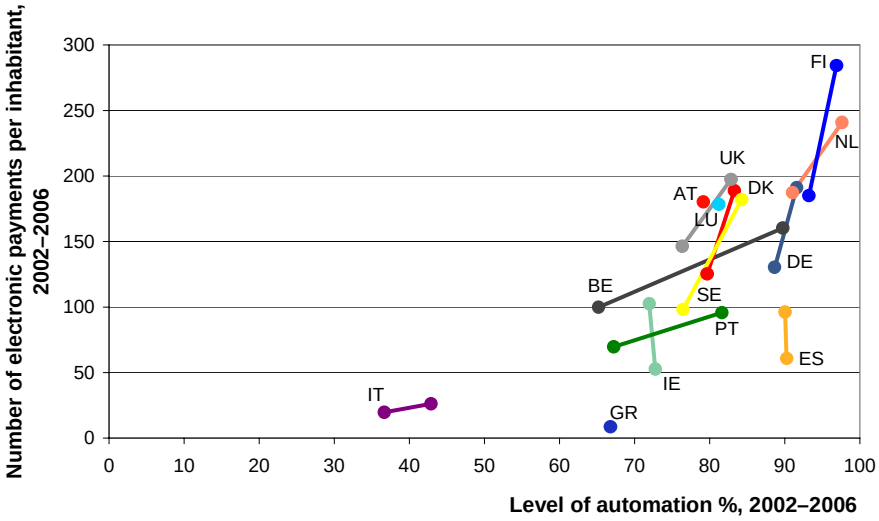
Figure 4.34 **E-banking-linked (Internet or PC) accounts per capita 2000–2006**



Source: ECB, Blue Book publications.

Many countries also publish the number of electronic payments initiated by customers. Based on that information, Figure 4.35 has been constructed to show the average number of e-payments per capita per year and the level of automation, ie the number of e-payments as a proportion of the total number of payments. Finland is the clear leader in this regard, with almost 300 e-transactions per capita per year and an automation level above 96%. The Netherlands is a quite close second. However, the overall picture is very scattered, albeit with a clear trend towards the upper right corner.

Figure 4.35 **Electronic payments and automation levels in selected countries 2002–2006**



Sources: ECB, Blue Book publications and Bank of Finland.

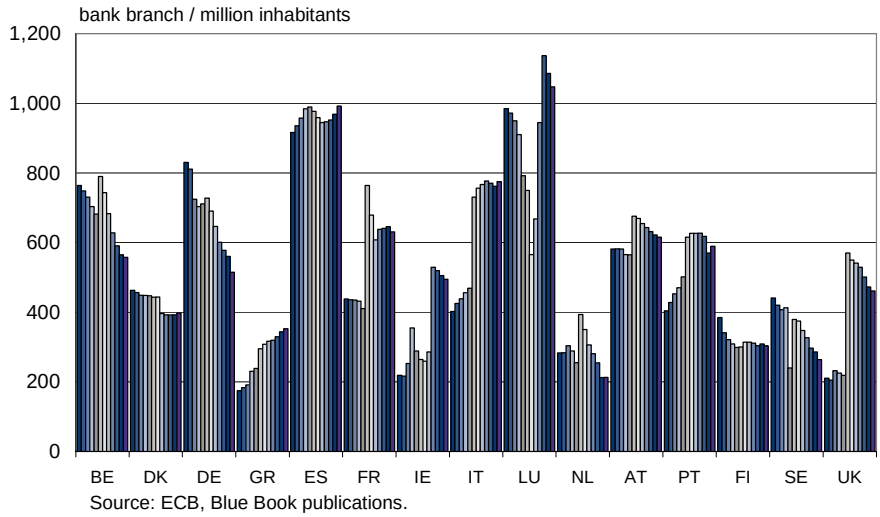
The penetration level of e-banking would be an interesting figure to compare between countries, but it is not available in public statistics. The share of Finnish private e-banking users was about 80% based on market surveys in 2006, and among corporate customers it is very close to 100%.

4.10 Branch banking statistics

The traditional way banks have provided payment services has been via their branch networks, but modern automated and network-based distribution channels like e-banking are taking up a big share of the payment load, which is partly reflected in the number of bank branches and bank employees in Figure 4.36 and Figure 4.37. The relative number of bank branches has decreased in many countries throughout the period analysed: eg Belgium, Denmark, Germany, Finland and Sweden. Several countries show a stepwise increase in the middle of the period due to a change in the definition of a branch. After this methodological change a clear reduction can again be seen, eg in Ireland, Austria, the United Kingdom and the Netherlands. Greece and Italy show a continuous increase in branch numbers, while the situation in Spain has been quite stable during the period analysed.

The highest concentration of bank branches, more than 1,100 per million inhabitants, is found in Luxembourg, due to its position as a financial centre. Otherwise, Spain (with about 950 branches per million inhabitants), France (about 650), Italy (about 750), Austria and Portugal (both with about 620) have the densest branch networks. The sparsest networks can be found in Greece, the Netherlands, Finland and Sweden, all with less than 400 branches per million inhabitants.

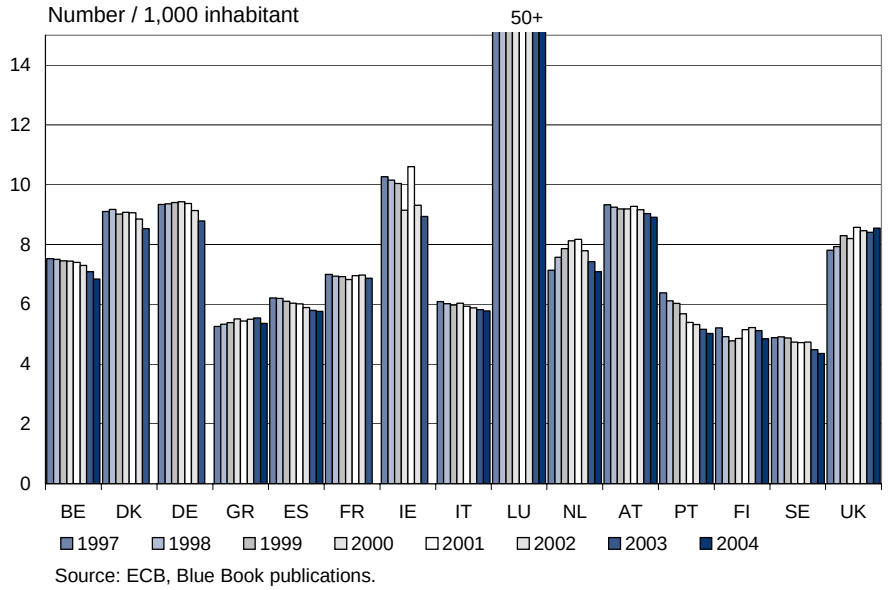
Figure 4.36 **Number of bank branches 1995–1999, and number of (branch) institutions offering payment services 2000–2006, per million inhabitants**



Source: ECB, Blue Book publications.

The number of bank employees has been surprisingly stable during the period analysed, while the average number of employees per thousand inhabitants shows only moderate variation across countries. Luxembourg is an exception, due to its position as an international banking centre. Denmark, Germany, Ireland, Austria and the United Kingdom are all on roughly the same level of about 8 to 9 bank employees per thousand inhabitants. Greece, Spain, Portugal, Finland and Sweden operate on the level of 5 to 6 employees. However, this indicator is very rough and does not pay attention to differences in services and work loads between countries. Increased outsourcing also affects the figures.

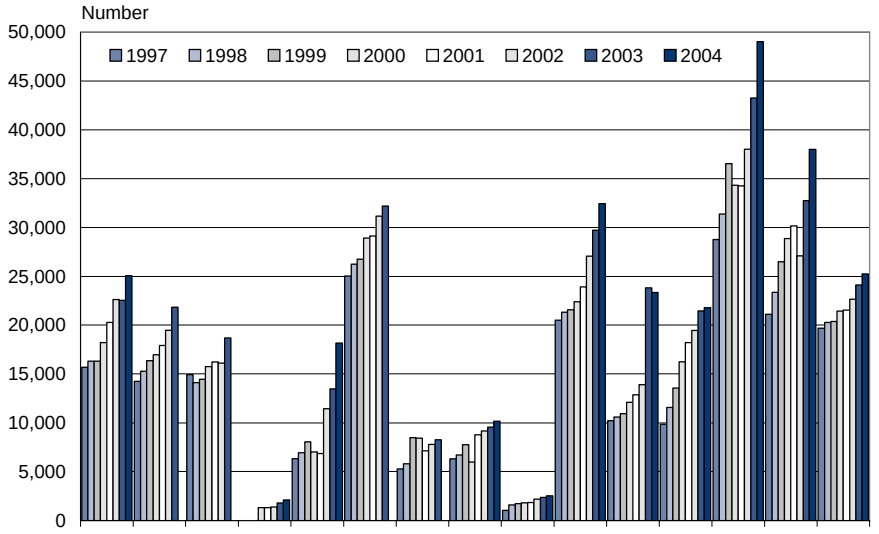
Figure 4.37 **Number of bank (MFI sector) employees per thousand inhabitants**



Source: ECB, Blue Book publications.

In Figure 4.38, the workload of non-cash payments is distributed across bank employees, and clear differences can be noted. Payment workload volumes have increased in all countries, but, at the same time, payment automation and straight-through processing have reduced manual tasks. The payment volume per employee is clearly largest in Finland, with an average of almost 50,000 transactions per employee per year. In contrast, the volumes in Greece and Luxembourg are radically less, at below 2,500 transactions per employee per year. As non-cash payment volumes are continuously growing more strongly than staff numbers, the average workload per employee has grown considerably during the period analysed, which would not have been possible without payment automation.

Figure 4.38 **Number of non-cash payments per bank employee (MFI sector)**



Source: ECB, Blue Book publications.

4.11 Summary of statistical developments

There are three non-surprising trends clearly visible in the payment developments:

– non-cash payments are increasing steadily and replacing cash payments
– electronic payments are replacing paper-based instruments
– self-service is replacing branch banking.

There are also other interesting, if less immediately apparent, findings in the study

– the use of ATMs has begun to decrease as card payment at point of sale grows rapidly
– the use of debit cards is growing faster than credit card usage, but there seems to be a small reverse trend during the last two years
– direct debits seem to be losing some market share to other payment instruments.

These changes would appear to be driven by a combination of cost-savings and convenience. However, the changes in payment behaviour seem to be quite slow. Major changes in payment habits need 5 to 10 years in order to be generally adopted. One reason for the slow speed of change is probably the lack of transparent price and cost information. Customers' decisions will therefore only be partly affected by cost considerations.

One striking finding in the analysis is the large national differences in payment habits and the use of payment instruments. Although developments are mostly tending in the same direction, it will take many years for Europe to achieve more uniform payment habits. Although the SEPA project will during the next five years standardise payment instruments and their processing in Europe, it will be a much longer project to harmonise national payment habits.

The statistics also point towards a gradual evolution based on improvement of the current payment instruments. New electronic and mobile instruments based on modern technology and developed separately from traditional (credit transfers, direct debits and card payments) have not been able to get general acceptance. There have been a large number of trials, but none of these have led to services of any great statistical importance. However, even though the past history does not support these kinds of developments, we may actually be on the threshold of a major digital revolution in payments, as has already happened in other digitalised network industries. This kind of development could considerably alter the direction of past statistical trends, especially as younger customers seem to be more ready than their elders to change their payment habits.

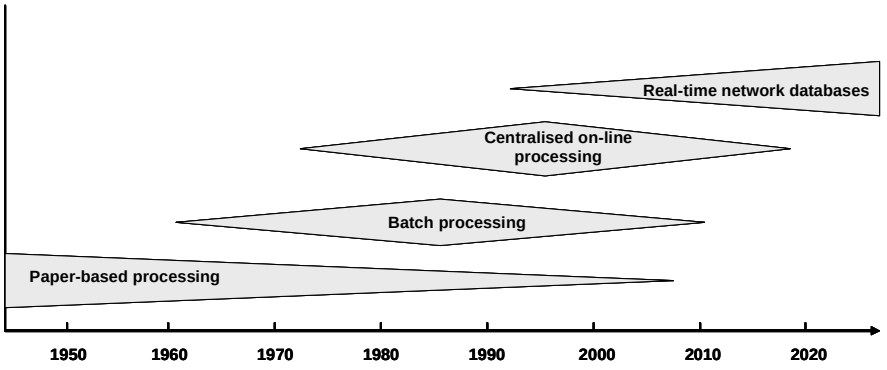
5 The cost and structures of payment instruments

The costs of payments are defined in this study as the different costs encountered by all involved parties in the process for handling payment transactions. However, it is important to distinguish between costs and pricing, especially as payment services are currently mostly priced without a direct link to the cost factors.[17] Payment services are often cross-subsidised and/or priced using non-transparent pricing mechanisms, which makes it difficult to asses the individual and overall tariffs for payment services. Customers see the tariffs as their costs. However, in this chapter it is only the true costs of different payment methods which are analysed. Pricing issues are analysed in the next chapter. The present chapter focuses on the cost factors of paying and on comparing costs of the different payment methods with a view to determining which are the efficient payment instruments in different circumstances.

5.1 Development stages of payment processing

The development of payment processing has strong ties with ICT developments and has followed the main steps in technological development as depicted in Figure 5.1.

Figure 5.1 **Levels of IC technology**

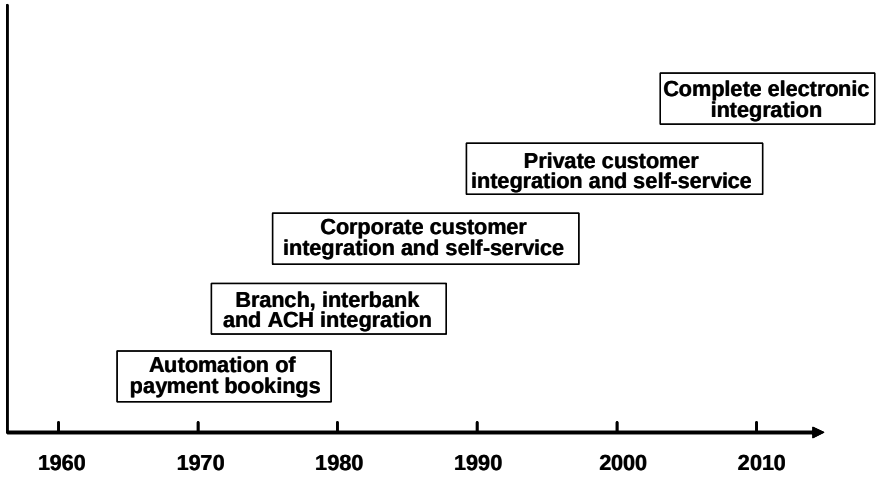


[17] Enge (2006) and Guiborg and Segendorf (2004).

The different IC technologies have been employed in an overlapping way. Paper-based processing has remained in use for a very long time for some instruments (eg cheques). The IC era began with the implementation of stand-alone batch applications and processes. In the first wave of integration, communications between applications and computer sites were based on physical transfers of magnetic tapes or other physical media. Proper data communication developed in the 1970s and was implemented widely in the 1980s, with centralised on-line processing emerging at the same time. Web-based technology with distributed databases has been implemented from the 1990s onwards and is taking banking and payments into the network economy.

The implementation of ICT has been a stepwise partly overlapping process within the banking industry and has followed a common pattern in most EU countries, as described in Figure 5.2.

Figure 5.2. **Steps in the implementation of IC technology for payments**



The automation of payment systems began with payment bookings and account maintenance within the separate institutions and without integration between different applications. The next step, internal integration, was taken in order to reduce the costs of mass input integration between applications, branches, banks and clearing centres. Paper-based data on interbank transactions was converted into electronic formats. In the third step, integration and self-service were expanded to large corporate and public customers, particularly those

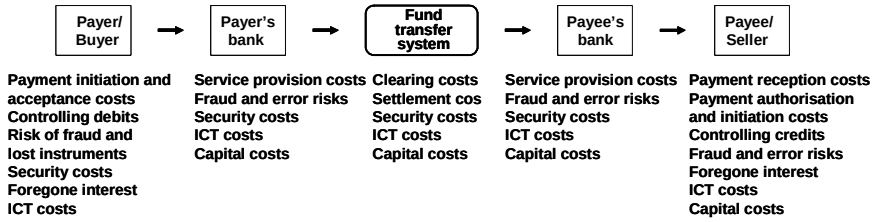
using mass-payment services. Private e-banking customers were the main focus in the fourth step, which relied heavily on Internet services. In the fifth step, which is just beginning, payments will become integrated with basic business processes such as e-invoicing and e-ordering, and the whole process will become completely electronic.

This increased use of ICT has had a major impact on the costs and cost structures of payment processing. Automation has reduced both total costs and the share of labour costs. The paper process was very labour intensive and most of the costs were variable. ICT structures, especially those of the early years, initially required heavy investment in ICT centres and software. The share of fixed costs therefore increased sharply. The subsequent strong and sustained decline in ICT hardware and software costs, increased standardisation and growing opportunities for outsourcing have considerably reduced cost levels and particularly fixed costs, especially in recent years. The costs of payments will soon become marginal and comparable to sending emails. Standardisation, shareware, freeware and object-oriented processing together with low-cost server technology and communication will once again change the cost structure towards a higher share of variable costs, but at a much lower level than before.

5.2 Payment cost structures and methodological issues

A payment is basically a transportation process in which a specific amount of funds is moved from the payer's account to the payee's account. All payment methods accomplish this same transportation task (including cash payments, as is shown in Chapter 5.5). In the general payment setup there are five parties involved: the payer, the payer's service provider (bank), the interbank transfer institution, the payee's service provider (bank) and the payee. All will have some costs for processing the payment. This transportation process, its participants and their costs are described on a general level in Figure 5.3.

Figure 5.3 **General design, participants and their costs in a funds transfer process**



The chain can be more complex, with tiered banking structures where correspondent banks service each other on a hierarchical basis. In some cases, as with cash, travellers' cheques and some card payment systems, there will be separate wholesale issuers, while retail distribution is maintained by the banks. The fund transfer system can be missing in the case of direct bilateral transfers and settlement among the banks. Also, in the case of both payer and payee banking with the same bank, interbank processing will be missing. However, in that case the same bank will perform the tasks of both the payer's and the payee's bank.

Each party in the processing chain performs the same basic tasks irrespective of which position it occupies in the chain. The order of tasks and their technical setup differ for different payment instruments and situations, but the basic tasks remain the same. They are:

– receiving a payment instruction
– checking the correctness and validity of the payment instruction
– booking the payment instruction
– making preparations for sending
– sending the payment instruction to the next link in the chain
– reconciling the payment instruction with the next link in the chain
– archiving the payment instruction
– correcting any errors in the payment process
– recording suffered credit or other losses.

Based on this categorisation of tasks and their associated costs, together with the different payment instruments, we can construct a total cost table for payment costs in the economy (Table 5.1).

Table 5.1 **Total payment costs of an economy**

	Cash				Credit transfers				Cheques				Direct debits				Card payments				e-money paym.			
	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank
Reception costs																								
Validation costs																								
Booking costs																								
Preparation costs																								
Sending costs																								
Reconciling costs																								
Archiving costs																								
Correction costs																								
Costs of losses																								
Total costs	Σ				Σ				Σ				Σ				Σ				Σ			

The table can be expanded with more payment instruments (eg e-money payments) for economies where some other instruments also play an important role.

The credit transfer process is the simplest example of this cost model. The payer receives an invoice or some other instruction to pay. He has to validate that this is correct: the reason, the amount and the receiver. He can then book it as payable. The payer has to prepare sending of the payment by having an account with a provider of payment services and the necessary identification instruments, ensure liquidity and also ensure the necessary facilities in the case of e-payments. The payment instruction can then be sent to the bank on paper or electronically. The payer must later reconcile the transaction, ie confirm that the bank has booked the transaction correctly. He will also archive the payment information (invoices and statements of accounts). If there are errors, he will have extra costs for correcting them. If the payment is booked incorrectly due to validation errors etc, there could also be real losses of capital. The payer's bank will in turn face exactly the same tasks and cost types: the payment instruction is received, it has to be validated, booked, sent on, reconciled with the interbank system and archived. The interbank system will in turn receive the payment instruction, validate it, send it to payee's bank, reconcile and archive it. The payee's bank will carry out the same tasks, and the payee will finally receive the payment. At the payee end of the process, reception was preceded by sending, as the payee sent the instruction to the payer.

Debit pull instruments contain the same tasks but in a different order, as the payee sends the payment instruction to the payee's bank

after reception from the payer. In the case of cheques, the payee typically provides an invoice or receipt and the payer hands over the cheque, for which he has the preparatory work of getting it from the bank and ensuring liquidity. The payee then presents the cheque to his bank, which forwards it to the interbank system for transfer to the payer's bank, and in the final stage the payer has to reconcile the reception and the correct booking of the check that was handed over to the payee.

The same model also works for cash payments. The payer receives a payment instruction in the form of a receipt or invoice to validate and book. In order to send the payment, ie hand over the notes, he has the preparatory work of getting the cash from his bank account from a teller or an ATM. The payee, generally a merchant, has to transport the cash to his bank, reconcile bookings etc. The cash will in most cases be reloaded into an ATM via an interbank process. In cash payments, the payee has to be prepared to give change, which is part of his preparatory work.

This general model will perhaps be used in future empirical cost studies by the Bank of Finland, but it could not yet be used in this study due to limited resources and time for collecting cost data. The model and table will, however, be used assess the comprehensiveness of the different available payment cost studies described in the next section.

There are some difficult methodological problems in empirical data collections

- banks and customers have not generally registered all their payment-related costs separately in their internal cost accounting
- a number of costs items are common to several payment instruments and other bank services
- fixed costs need to be distributed across transactions and over time.

As payments are seldom separate profit centres in banks and cost centres at customers, payment costs are not separated out and aggregated in cost accounting, and such information can therefore only be retrieved by separate analysis. Such analysis has to rely on some arbitrary cost distribution concepts. All payments require booking services from the payment account systems, including ATM withdrawals and cash deposits. Cash is mainly withdrawn from ATMs using cards. How should the deposit account and card costs be distributed on cash services? Bank branches serve customers using several types of products. What would be a suitable cost distribution

scheme? All payment instruments contain investments that can be used for several years. This requires depreciation plans, but these are seldom similar across banks, processing institutions and companies. As payments are seen mostly as general overheads, these depreciation plans are probably mostly based on administrative rules and do not reflect the economic life span of the investments.

When they issue bank notes, central banks receive seignorage income, which can be seen as interest-free bonds. The other parties will see this as a cost item, because they forego the interest. Central banks can also require banks to keep reserves deposited at the central bank based on the payment and deposit balances of their customers' accounts. The banks will see this as extra costs for keeping payment accounts, as central banks pay less interest than the market rate. The banks must, in turn, levy these charges on their customers. Customers forego interest when banks process payments slowly and/or use value days. In both cases, the customer will receive less interest on positive balances and pay more interest on negative balances on their payment accounts. As central banks could, at least in theory, pay interest on outstanding cash and pay market interest on reserve requirements, these should be seen more as pricing mechanisms than 'true' cost items. The same is true for float costs, as banks could provide services without float, which is actually required by law in some countries (for example Norway), and the Payment Services Directive will reduce float possibilities considerably in the SEPA region.

5.3 Recent payment cost studies

There have been four recent payment cost studies conducted in Europe. The first, by the Dutch central bank, focused on payment costs for point-of-sale payments.[18] Studies of a similar kind have since also been conducted for Belgium[19] and Sweden[20]. The Bank of Norway has carried out a separate cost study focusing on banks' costs for all kinds of payment instruments.[21]

The Dutch, Belgian and Swedish studies build on the same kind of cost and revenue model. There are four parties involved in the process: central banks, banks, merchants and consumers. Each of

[18] Brits and Winder (2005), cost estimates from 2002.
[19] National Bank of Belgium (2006), cost estimates from 2003.
[20] Bergman, Guiborg and Segendorf (2007), cost estimates from 2002.
[21] Gresvik and Øvre (2003), cost estimates from 2001.

these has revenues, internal costs and external costs to the other parties. As revenues are received from the other parties, the external costs of these, the total 'true' processing costs in the model are the sum of the internal costs. Table 5.2 compares the scope of these studies with the table on total costs (Table 5.1) defined in the previous section.

Table 5.2 **Scope of the Dutch, Belgian and Swedish studies**

	Cash				Credit transfers				Cheques				Direct debits				Card payments				e-money paym.			
	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank	Payer	Payer's bank	Interbank	Payee's bank
Reception costs																								
Validation costs																								
Booking costs																								
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Sending costs																								
Reconciling costs																								
Archiving costs																								
Correction costs																								
Costs of losses																								
Total costs	Σ				Σ				Σ				Σ				Σ				Σ			

The Dutch and Belgian studies include the cost of cash, card payments (both credit cards and debit cards) and e-money payments. The Swedish study excludes e-money costs, as there is no generally used e-money scheme in Sweden. All studies exclude the costs of private customers, which can be seen as the payers, with the merchants as payees.

The main findings of these three studies are summarised in Table 5.3. There are considerable differences both within and between the countries in these studies. In Sweden, both debit and credit card payments are less expensive than cash. In Belgium cash, debit and e-money payments are almost on the same level, while credit card payments are clearly the most costly, as also compared with credit card costs in the other countries. In the Netherlands, cash has the lowest average costs.

Table 5.3 **Main results of the three empirical payment cost studies (EUR)**

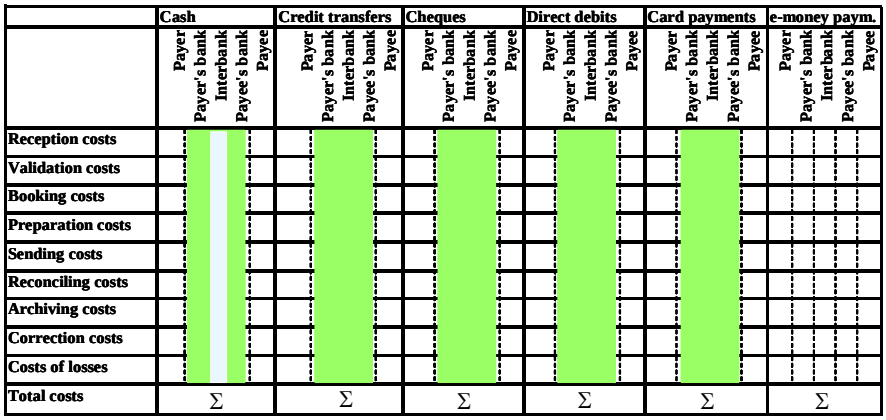
	Netherlands	Belgium	Sweden
Average transaction costs, cash	0.30	0.53	0.50
Average transaction costs, debit cards	0.49	0.55	0.34
Average transaction costs, credit cards	0.93	2.62	0.48
Average transaction costs, e-money	3.59	0.54	
Break-even, cash to debit cards	11.63	10.24	8.00
Break-even, cash to credit cards		60.88	18.00

In all three studies, the costs of the different instruments are categorised into fixed and variable costs. Cash has more variable costs than the others, depending on the amount to be paid. The costs for card and e-money transactions are mostly fixed. The interest costs embedded in credit card payments increase the variable component, depending on the amount of the payment. This provides the opportunity to calculate a break-even point for the amount of payment when using different instruments. The costs of cash will be lower than debit cards in Sweden when the payment is below 8 euro, while the same point is at 10.24 euro in Belgium and 11.63 euro in the Netherlands. As these estimates are from 2001–2003, the break-even point is already lower.

All three studies show that it would be efficient for society to increase the use of electronic account-based payments and reduce the use of cash and manual payment transactions. However, all conclude that cash will still be an important means of payment in the future, especially for smaller payments, although its volumes will probably decline.

The Norwegian study is based on a more profound cost methodology where the costs are distributed across the different bank payment products using Activity-Based Costing (ABC). The study focuses on the costs of the banking sector and does not include the payment costs of merchants or consumers. It also excludes the costs of the central bank. However, it does encompass all the different payment instruments and, on a very detailed level, the different forms of credit transfer (branch-initiated, web-initiated, initiated by company terminal etc). A comparison of the scope of the Norwegian study is presented in Table 5.4.

Table 5.4 **Scope of the Norwegian payment cost study**



This study identifies the bank costs for providing specific payment products, and the most interesting are (original values have been rounded to the nearest NOK 0.50):

– the costs of credit transfers via company terminals EUR 0.58/transaction
– the costs of credit transfers initiated via the Internet EUR 1.04/transaction
– the costs of direct debits EUR 0.65/transaction
– the costs of (remaining) cheques EUR 2.91/transaction
– the costs of ATM withdrawals EUR 1.04/transaction
– electronic point-of-sale transactions (EFTPOS) EUR 0.32/transaction

These costs are difficult to compare with the other studies, because they do not contain merchants' costs. However, it seems that the ABC method would distribute more overhead costs to the products than was included in the other three studies, as the banks' costs alone are quite high compared with the other studies.

5.4 General bias and comparison problems in actual payment cost figures

It would be interesting to be able to conclude which payment instrument is the most efficient based on the cost figures. However, there are several problems in making such conclusions based on the information available:

- costs vary between payment situations, and average findings cannot therefore be generalised for all payment situations
- the size of the payment will affect the costs differently across instruments
- the volumes of different payment instruments are most often based on tariffs and non-transparent pricing, which do not reflect the true costs, but have often been significantly cross-subsidised, resulting in biased volumes (see for example the detailed Norwegian figures[22] and the discussion on pricing in the next chapter)
- the biased volumes will result in biased average costs when fixed costs are distributed across all transactions
- payment systems and infrastructure seem to lag behind in ICT developments compared with other industries, resulting in comparatively higher costs
- payment services are a regulated industry, which results in regulatory distortions and development barriers
- issuing cash currency and providing wholesale cash services, and to some extent also retail cash services, belong to the government cash monopoly, which has by tradition been priced non-transparently (customers generally regard cash operations as free)
- the customer costs for using and accepting different payment instruments are often left partly or completely outside these studies, which therefore generally reflect only the costs of the service providers
- the cost data is derived from older systems like ACHs, which generally operate under monopoly conditions, and from banks, which have in cooperation agreed upon given services, resulting in non-competitive service provision
- a chicken and egg situation results in high initial costs for new payment instruments before they can reach critical mass, while already operating instruments can regard old investments as sunk costs and provide services at marginal cost when competing with new instruments.

For long-run cost comparisons (including investment and re-investment needs) average transaction costs for different instruments in different situations would be essential information for assessing the efficiency of different instruments. However, such an assessment would also need estimates of future volumes and price signals, or other measures to achieve those volumes. For short-run cost

[22] Norges Bank (2001–), Annual Report on Payment Systems.

comparisons, the marginal costs of the different instruments would be sufficient. This would require information on the variable costs for each payment instrument. The true variable costs probably represent only a very small share of total costs in modern payment instruments. What might at first sight look like variable costs will be in most cases be hidden fixed costs. For example, clearing centres often price their services per transaction, but internally their costs are mainly fixed and the transaction prices are just based on expected transaction volumes. Internal ICT costs are often distributed based on volumes, but capacity is often fixed for a longer period and thereby semi-fixed, if not actually completely fixed. Different kinds of outsourcing agreements are also paid based on volumes, although the service provider will have derived the charges based on the total fixed costs and expected volumes.

As the currently available cost information is difficult to apply for general comparisons between instruments, this study employs an alternative method by splitting the payment processes into basic sub-processes. The differences between the various payment instruments are then compared on the sub-process level. It is then assumed that the costs for the same kind of sub-process are the same across instruments. The differences in cost efficiency between instruments would then depend directly on the number and types of sub-processes employed. As all payments result in a debit from the payer's account and a credit to the payee's account, the basic sub-processes of debiting and crediting an account cannot make the difference, which must be sought in the overall process, and especially among customer processes.

5.5 Future developments towards basic sub-processes and standardised cost factors in payment processing

In the payments industry, as in other industries, we are heading towards a network environment of integrated server-based processing in which the basic processing tasks are split into independent processes carried out in a standardised flow of linked sub-processes. The cost items in the general process described in Figure 5.3 can therefore be split into basic sub-processes common to all the different payment instruments. The costs of this future environment and current payment processes are therefore evaluated against this future scenario.

Each sub-process carries out one specific part of the total process. These sub-processes can be categorised into three main groups: look-up processes (L), update processes (U) and communication processes (C). The tasks of the general payment process can be divided into a limited number of general sub-processes as shown in Figure 5.4.

Figure 5.4 **The sub-processes of a general payment task**

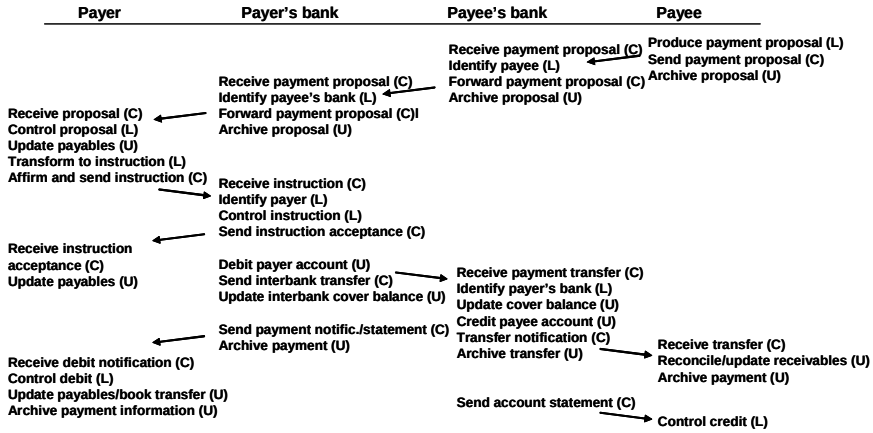


Figure 5.4 shows a completely integrated electronic modern payment flow, especially for business-to-business payments:

- It starts with the payee producing a payment proposal based on what is agreed with the payer, which is generally based on an order of some kind. In most cases the payment process will be a continuation of the order process. The proposal is archived and sent to the payer (as an e-invoice for credit transfers, direct debit or card payment), in this case using the banking infrastructure.
- The banking infrastructure is well placed to forward this payment proposal to the payer using the interbank payment network and its addressing system. The payment proposal will in most cases be a complete e-invoice, as will be described in more detail in Chapter 9, which deals with service developments. In fact, payments and e-invoices will merge and carry the same information, and there will therefore be no need in the future to send separate invoices.
- After receiving the proposal the payer will check it against his order information and update the payables file. In order to make

the payment, the proposal is transformed into a payment instruction, affirmed and sent to the payer's bank.
- The payer's bank receives the payment instruction, identifies the payer and checks the content of the instruction, after which an instruction acceptance message can be sent to the payer to update the payables files accordingly. The payer's bank will debit the payer's account at the due date/time, when it will become a final payment transfer and in the general case be sent via an interbank transfer to the payee's bank.
- The sending bank will accordingly update the interbank cover balance (the interbank cover transfer process is kept simple in this presentation in order not to overburden the picture; a more detailed presentation can be found in Chapter 10, which deals with market developments). The payer's bank will also notify the payer about the debit of the account.
- The payer has to verify the debit, and the payment can then be updated in the payables and archived as a fully completed and final payment.
- The payee's bank will receive the transfer and check its origin, update the interbank cover balance, credit the payee account and send a reception notification to the payee as well as archive the transfer. At some point, a statement of the account is also sent to the payee.
- The payee will, based on the notification, reconcile and update the receivables file, archive the payment and check the credit.

Figure 5.4 illustrates the general sub-processes of a completely successful payment. There also need to be the full range of sub-processes needed for every type of error situation, eg the wrong account number, disagreement on proposal details, not enough funds for debiting etc. These are not included in the diagram in order to keep it simple.

The description shows the process especially for business-to-business payments. However, the process for consumer-to-consumer, business-to-consumer or consumer-to-business will have basically the same features albeit the updating of payables and receivables might be less concrete. However, consumers still need, at least to ensure peace of mind, to check that the necessary invoices are paid correctly and payments received as expected. This will probably be an area in which we will in future see value-added services provided by banks to consumers, for example an easy-to-use receivables and payables service that automatically checks consumers' payment flows and

reports only unexpected events (eg too small, too large or delayed salary payments, insurance paybacks, direct debits etc).

In an open and immediate network environment, the same process flow can be used for all the different instruments: credit transfers, direct debits and card payments. All will follow the same basic logic. The payee provides a payment proposal that has to be accepted by the payer, after which it can be debited from his account and credited to the payee. Physical cards are in this context only used for customer identification and storing the account address information in order to speed up the processes at payees' terminals. For direct debits, the payer has provided the bank with a mandate to accept a given type of payment on behalf of the payer, so the acceptance part of the process flow is moved from the payer's site to the payer's bank's site based on a delegation. The bank will check that the payment is from the correct payer and in line with what could be expected (eg size and frequency of payment).

Each process in the diagram represents a cost factor, and these have been categorised as communication (C), look-up (L) and update (U) factors according to the resources needed for the processes. Communication processes require communication resources, look-up processes require database reading and update processes require storage capacity.

This general description of the payment process includes 16 communication, 10 look-up and 15 update sub-processes. The costs for making a payment would consist of the total costs of these individual processes plus an overhead mark-up for error messages and the fixed costs for specialised components such as any proprietary customer-identification device. Three interesting conclusions can be made based on this long-term development scenario:

- as the different payment instruments/methods approach each other so will their costs and cost structures, ie they will converge into one basic process with some variations
- as payment processing is progressively divided into standardised sub-processes supported by common program libraries and freeware solutions the share of fixed costs will decrease and we will probably be back to a situation with mainly variable costs
- the costs for payment processing will decrease as sub-processes are electronified and ICT costs decrease (which they will do rapidly, as will be shown in Chapter 8).

5.6 Structural cost differences in present account-based payment methods

Although the end result of all account-based payment methods is the same, a transfer of funds, several different payment methods have emerged over the years. The reason there are so many different payment methods and variations thereof can be found in the history of payments. As technology advanced, the new possibilities were used to improve services, but in most cases the new versions became additional possibilities coexisting with the old ones. This has resulted in the quite complex situation of today. Structural changes are clearly needed in order to save costs by simplifying the complex structure of today.

Compared with the long-term scenario presented in the previous section, the costs of current payment services differ for the following reasons:

- the mix of manual paper-based, semi manual and electronic sub-processes
- inherited structures due to the legacy of paper-based processing patterns
- the mix of different ICT generations (eg batch processes versus on-line)
- users' different ICT capacities
- the separation of payment processing flows according to payment instruments, ie several redundant parallel infrastructures and applications.

The development towards improved cost efficiency has consisted mostly of replacing manual paper-based process with electronic processes. For example, e-invoicing will remove the need for paper-based payment proposals/invoices. In the past, different kinds of special optic or magnetic ink coding have been used, allowing automated reading of the paper document by a semi-manual process. The same developments can also be seen in cheques, and will ultimately convert them to electronic card-like payments. One concrete illustration of these differences could be 1) manual typing in of the data from an invoice, 2) semi-manual scanning of the invoice data optically, or 3) automatic reception of the invoice data directly into the application in electronic format.

Cost savings began with all instruments by automating the processes within the bank, extending this to interbank processes and

finally to the processes between customers and banks and within customers' own systems.

Credit transfers are already highly automated. Almost all processes in and between banks are automated. The focus at present is on automating customer processes. For this, the data content of the credit transfers needs to be expanded with structured references and complete e-invoicing data. Structured references are the key elements for automated reconciling of payments. The solutions for efficient e-invoicing are already in place in the Nordic countries, and its use is catching on strongly. The last remaining manual or semi-manual processes in the credit transfer flow are verification of the payment and of debits and credits. Corporate customers can automate the verification of debits and credits when standardised statements of accounts are available with references for automated reconciling. However, it would also be in the interest of private customers to get a service that can automatically reconcile their bank accounts against a list of accepted payments. Most customer payments can be accepted in advance when they are repetitious or the amount is otherwise known in advance. Banks could be mandated to accept these kind of payments automatically.

Cheques are basically paper-based instruments with a lot of manual processes, although the interbank processes have been automated via cheque truncation and cheque images. However, the customer processes will remain manual. Compared with credit transfers, the cheque process is more complex, as the cheque needs to be sent to the payee after reception of the invoice. Thereafter, the cheque can be presented to the payee's bank and then physically or electronically processed via the banking system to be debited from the payer's account. In comparison, a credit transfer can be generated directly from the invoice or the accompanying payment instruction (giro form). Their limited automation possibilities and extra manual processes make cheques a very inefficient instrument compared with the other account-based payment methods. In more advanced countries, cheques have therefore been replaced almost completely by card payments or other account-based payment methods.

Direct debits emerged because the growing use of IC technology at large invoicers/payees made it possible to move the payment data electronically from the invoicer to the banking system. The manual process of typing in payment data could then be reduced in bank branches, and the processes at the payers could be simplified. Direct debit is therefore very suitable in situations where the payee processes are automated but the payer is still working manually or semi-manually. When both the payee and payer are automated, an e-

invoice-based credit transfer with automated controls/mandates would be the more efficient solution, as it provides flexibility for the verification functions. In order to reduce the need for separate invoicing processes, direct debit data needs to be expanded with full e-invoicing data and structured reconciling information. Without this expansion, direct debits will be clearly less efficient than credit transfers based on e-invoicing. When the data content of credit transfers and direct debits is aligned and includes e-invoicing information, these instruments are, from a process point of view, very close to each other. The main differences can be found in contractual structures and how transactions are verified and confirmed.

Card payments have moved from primarily paper-based slips to electronic EFTPOS transactions. The slip-based card payment process was originally close to the cheque process, but the card could be reused to imprint several payments. The modern electronic EFTPOS process is quite close to the direct debit process. The card is read by the terminal to securely and efficiently retrieve the card number, which identifies the payer's account. In order to ensure sufficient funds, especially for larger payments, the payee system makes an on-line authorisation transaction to reserve funds from the payer's account. This adds several sub-processes to card payments, as there is a separate transaction flow later that makes the actual final bookings. One major problem in off-line environments has been the use of fraudulent cards. The costs and frequency of card frauds have generally been higher than for other payment instruments. When card payments move to on-line processing, the fraud figures will become close to those for credit transfers.

Customers' accounts have to be safeguarded against abuse. Only transactions accepted by the payer should be debited from his account. This requires thorough customer identification for transaction acceptance. Banks therefore need to invest in proper customer identification processes. These investments are often seen as a balancing act between the costs for reducing fraud and the achievable reduction in fraud costs. The costs for improving security will at some point be higher than the potential risk reduction benefits of the extra investment. However, this is a moving border line. Criminals learn to circumvent the safeguards in place, leading to increased risks, while on the other hand new, more efficient safeguards are invented and implemented.

There are four general situations/environments for customer identification:

– face-to-face at the bank branch
– remotely over the network by the bank's application
– face-to-face at a merchant outlet
– remotely over the network at/via a merchant site.

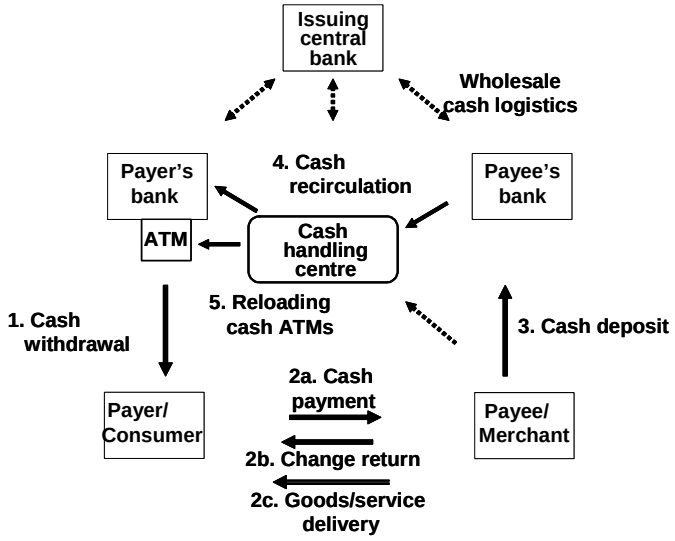
In face-to-face situations at bank branches, banks generally rely on official identification documents. However, the quality of these varies internationally. Due to increased terrorist and other criminal risks, there seems to be a trend towards improving the quality of passports and other official identification documents. Bank customers are increasingly using self-service equipment or e-banking, meaning banks need automated remote identification procedures. The open network environment of the Internet gives forgers and other criminals a good opportunity to hide behind anonymous servers and create viruses and Trojan horses. Banks have therefore over the years been forced to move from simple password protection to encrypted dialogues supported by specialised security processors. This will require further investment, as will be discussed in more detail in Chapter 8.

Cheques and cards used for face-to-face payments at merchants and banks have to rely on the merchants' personnel for proper identification. Forged cheques and cards are a clear problem in this environment, especially if there are no other identification requirements than that the cheque or card looks genuine and is not black-listed. Banks are therefore investing in chip cards, which are much more difficult to copy and have customer identification based on a PIN. There has been considerable card fraud in Internet-delivered services, especially as the only requirement for making a payment has been to know an existing card number. Different software solutions haves been tried to improve the situation, but a software solution in the open Internet world cannot be enough, as software can always be copied. The ultimate solution can only be an on-line credit transfer type of solution where the payer's bank identifies the customer using some kind of safe hardware solution with a PIN and some form of biological verification. This would point towards convergence of the identification processes towards a general model used by all payment instruments (see Chapter 8).

5.7 Cost of cash versus account-based payments

In contrast to account-based instruments, cash is a bearer instrument and the transfer of funds is carried out by physical delivery of notes and coins. Cash can therefore move in free circulation among payers and payees. Over time, however, cash circulation has changed and today very much resembles the account-based process. The payer withdraws cash from his payment account using mostly ATMs and pays at the merchant's, while the merchant deposits the received cash in his payment account at the end of the day. Cash circulation has become a closed loop. Cash is just used as an interim transfer mechanism for making the transfer of funds from the payers' account to the merchant's account, as described in Figure 5.5.

Figure 5.5 **Modern cash circulation**



The difference in the payer's process is that he will have an interim store of cash from which he can make several payments. All of these sub-payments require manual processes. At some point he has to replenish his store by withdrawing more money from an ATM. At the merchant's, cash is in most cases processed manually, the exception being different kinds of vending machines. At the end of the day, the daily turnover of cash is deposited in the bank so that it can be used for account-based payments. Today, merchants very seldom make any

cash-based purchases or payments. The bank will then reload the ATMs. It is clear from this description that an electronic card payment of the same size as an ATM withdrawal is always more efficient than cash usage. The card-based ATM withdrawal contains the same sub-processes as the card payment; however, all the processes relating to ATM maintenance and physical cash handling can be avoided. As cash payments are smaller than cash withdrawals and the withdrawal costs are therefore split across several physical sub-payments, there may be a point below which cash payments are more efficient. The Belgian and Dutch central banks' costs studies suggest such a point. However, this depends on ATM costs, banks' card payment costs and merchants' and consumers' payment costs for the different instruments. As card-based payment costs are going down and manual cash costs are going up due to general cost developments, this break-even point is becoming progressively lower. Introduction of a very efficient e-payment instrument could change the situation completely, with the new instrument being dominant in terms of efficiency compared with cash throughout all the payment value bands.

The security profile and costs are quite different for cash than for account-based instruments. The service provider, the bank, is responsible for keeping the account funds safely in custody. All types of account-based payment methods can be attacked by forgers and other criminals. Banks need to update continuously their security solutions as is discussed in chapters 8 and 11. The user generally has a limited liability regarding the safekeeping of the access instrument to the account (eg a payment card). The deposited funds held by the bank are mostly protected by a deposit insurance scheme. For cash, central banks guarantee convertibility, but the users themselves have to care for the safekeeping of the cash in their possession. Lost cash is lost cash, whereas erroneous account-based payments can be traced and corrected. Cash is a completely anonymous and non-traceable payment instrument, which makes it interesting for criminal, black market and grey market payments. This results in additional security costs for cash, both for users and for society as a whole. A large proportion of all crimes are cash related, for example cash transport robberies, other types of robberies and counterfeiting. Drug dealing and other criminal commerce would be more difficult if there were no government-guaranteed anonymous payment instrument. Society also loses tax income due to cash payments, which make tax evasion easier. There are, understandably, no detailed studies on the amount of

crime-related cash usage. However, there are some Nordic studies showing that about 50–60% of cash use is unaccounted for.[23]

5.8 Potential cost savings

The potential cost savings vary depending on the current levels of automation and standardisation. The results also depend on how large a proportion of customers' processes and costs are included in the calculations. As customer processes are less automated than bank processes, there are large potential savings in automating customer processes. There are very few studies on the potential cost savings from payment automation, and especially from enhancing the process as a whole.

The potential savings stem basically from two different sources: using more efficient processing methods and standardising the methods employed. SEPA will introduce standardised payment instruments for the SEPA region, which will reduce costs, as the same software can be reused in all countries. For example, the same EFTPOS terminal will function in all countries. The larger area will also increase consolidation and competition, both of which will reduce costs through higher efficiency.

One area for which there are benefit estimates is for the introduction of e-invoices for corporate customers (see for more details in Chapter 7). Finnish findings show a total net benefit of about 20–30 euro per invoice when a paper invoice is substituted by an electronic invoice that is processed completely automatically.[24] The sending company experiences about one third, and the receiving company about two thirds of these savings. The savings will be smaller if the companies have already used semi-manual processes like structure reference data and scanning of invoices. However, because the payment and invoice volumes are so huge, these kinds of savings per invoice can generate very large totals. There are about 60 billion account-based payments in the EU15 area, and paper invoices or receipts of some kind are linked to most of these. If only 20% of these could generate savings of 20 euro through e-invoicing, it would result in total savings amounting to 120 billion euro per year. If another 40% were to generate moderate savings in the range of 5 euro

[23] Paunonen and Jyrkönen (2002), Humphrey, Kaloudis and Øwre (2000), Andersson and Guibourg (2001), Gresvik and Kaloudis (2001).
[24] See www.finvoice.fi.

per transaction through automating consumer invoices, this would add another 120 billion euro to the total savings. Implementation of e-invoicing is by far the most potentially rewarding single undertaking for enhancing the payment process. The CAST project of the European Associations of Corporate Treasurers (EACT) has made a conservative estimate of EUR 243 billion for savings generated by the introduction of standardised e-invoicing.[25] More details on potential cost-savings from e-invoicing can be found in final report of the European Commission's Informal Task Force on e-Invoicing.[26]

The volumes are large. As noted above, there are about 60 billion account-based payments annually in the EU15 countries. The number of cash transactions has to be estimated by quite rough means. This would probably be an underestimate for the number of cash transactions, as, based on the Dutch central bank's study, the share of cash transactions in the Netherlands was reported to be about 70%. This figure is probably a little lower in the Nordic countries, but much higher in southern Europe and in Germany and Austria. Therefore, a 75% market share of cash in transaction numbers seems plausible. This would result overall in about 240 billion payment transactions a year in the EU15 countries based on the statistics for 2005.

Table 5.5 shows, just as a mathematical exercise, the potential total annual savings based on average transaction savings in the magnitude of euro 0.1, euro 0.25, euro 1 and euro 2.

Table 5.5 **Potential savings based on 240 billion payments per annum in the EU15**

EUR/trans	Total, EUR billion	GDP %/per annum	Per capita/year
euro 0.1	24	0.2%	euro 62
euro 0.25	60	0.6%	euro 155
euro 1	240	2.3%	euro 619
euro 2	480	4.6%	euro 1,238

The objective of Table 5.5 is to show how huge the potentials for savings are, especially when the potential customer cost savings are included. Manual processes for all kinds of payments always costs several cents, as a manual processing minute costs about euro 0.50 to euro 1.0, depending on the office surroundings and equipment, while paper forms also cost several cents each.

[25] See www.eact-group.com.
[26] European Commission (2007b).

The Dutch payment report estimates more than euro 0.07 cost savings when cash is substituted by debit cards or e-money.[27] The European Commission has estimated the SEPA savings to be in the range of 1–1.5% of GDP, which would translate to about euro 0.43–euro 0.65 per transaction and an average saving per inhabitant of almost euro 300 per year when e-invoicing benefits are included.[28]

The basic problem is that these kinds of average savings generated by a mass of payments do not catch the attention of the general public and key decision-makers. One-off robberies, forgeries etc with much less monetary value at stake seem to be much more interesting.

5.9 Barriers hindering cost-savings and incentives promoting cost-savings

Switching to new efficient technologies always takes time. The introduction of steam engines, electricity and televisions provide good examples from other industries. Banks seem reluctant to change their payment offerings and customers seem slow to change their payment habits. There are forces pushing for change and forces tending to maintain the old payment instruments and habits. The forces for change will over time gather strength, and at some point the new payment technology will begin to take over.

There seem to be several barriers currently delaying developments in payment systems:

- the legacy of old systems and investments
- unclear and stepwise ICT developments
- network externalities and the costs of parallel systems
- the huge coordination needed for simultaneous changes of processing patterns
- monopolistic structures
- complementary product status
- regulatory and other official requirements
- non-transparent pricing and cross-subsidising.

Banks and corporate customers have invested in the current payment processing environment and are reluctant to abandon investments that

[27] Brits and Winder (2005).
[28] European Commission (2005b) and (2008).

are still providing a basic service. ICT developments come in steps and it is difficult to foresee the next steps and when a new opportunity will mature. One example is the current discussion about contact-based or contactless smart cards, or whether we should wait until mobile SIM cards have evolved into general identification cards.

Payment services are a network product and in order for sufficient reachability to emerge there needs to be a critical mass of interoperable service providers and users. It is often problematic to start up new payment services, as this will often result in parallel services/systems with increased fixed costs. The current processing patterns of payments are complex and employ a large number of participants and their applications. The adoption of more efficient payment patterns and processes requires coordinated changes of all involved systems and applications. For example, adding a completely electronic invoice or receipt to card payments will require changes to banks' payment systems and networks, but also to payees' and payers' invoicing processes, in order for the benefits to be realised. Interbank payment networks and clearing centres are mostly monopoly institutions, and development decisions will require a good majority among the participants. The status of the payment as a complementary product means that the volumes are given (nobody pays merely for the joy of paying, but due to the underlying contract, and customers always have a budgetary limit for paying). Developments will therefore seldom increase volumes; they will decrease costs and margins. This results in current service providers often adopting a wait-and-see stance regarding new developments. Customers have to use and pay for the available systems and services, as there are no alternatives.

Payment services are regulated and mostly reserved for service providers with bank status (or near bank status), which limits competition. In addition, cash issuing is a monopoly of the central banks, which at the same time also provide and regulate cash-handling services. Cash has been the default payment instrument and legal tender when the payer and payee do not agree on other payment methods. The non-transparent pricing structure of cash and heavy cash cross-subsidising result in a difficult pricing barrier for new instruments, as it is hard to charge less than zero (see next chapter for details). This non-transparency of the true costs is probably the strongest barrier to change, as it obscures much of the development benefits.

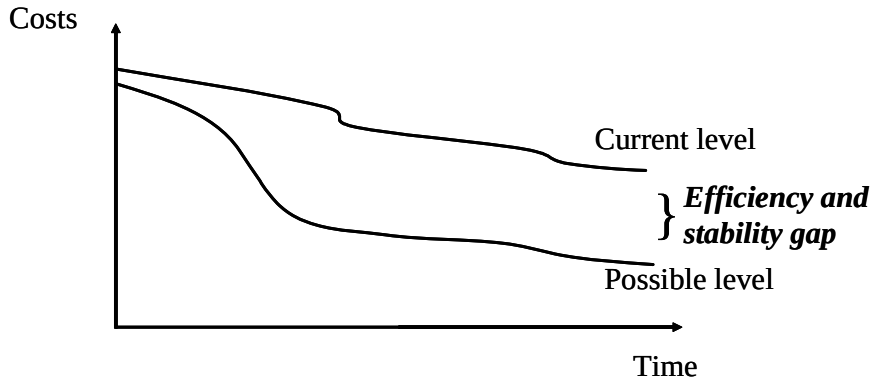
The forces pushing for change are rather limited in number:

– striving for higher efficiency
– examples and analogies from other more advanced industries
– customer demand
– competition
– actions by authorities.

The successful application of technology in other industries will increase demand for the same change in payment systems. Adoption of on-line ordering and updating services for airline ticketing plus immediate email delivery will also increase the demand for on-line payments. Customer demand will at some point be so strong that a requested service has to be developed. Outside competition or merely the threat of it is often the critical factor that triggers change among traditional service providers. Authorities can also demand change, and the SEPA project is a good example of this.

The cost or efficiency difference will grow over the years when a status quo situation continues unchanged (see Figure 5.6). This will increase the pressure for change and will at some point trigger the necessary development. Generally speaking, the wider the development gap, the greater the probability that the authorities will use their power to introduce a political solution.

Figure 5.6 **The increasing efficiency gap**



5.10 Summary of developments in payment costs

The history of recent payment developments is the history of the gradual introduction of IC technologies. The payment industry has gradually introduced new ICT-based enhancements, starting from internal applications and moving step-by-step towards customer integration. We are heading towards complete real-time e-integration. The costs of payment services will decrease significantly when the last manual and semi-manual processes are completely electronified. In fact, the costs for paying will be directly dependent on the number of manual and semi-manual processes needed in a particular payment, as manual processes will be such a dominant cost factor. In a real-time environment, the funds transport service, which is the essence of payments, can be structured to form a network of basic interrelated sub-processes. These sub-processes are common to all payment instruments, and the current payment instruments will therefore most probably converge in the future towards one common payment method.

It is typical for all industries, but especially true of the payment industry, that the resistance to change is strong. This will cause a build-up in pressure for change over the years, which at some point will result in a large and sudden change when the resisting forces give away. The strongest resistance factor is probably the non-transparent pricing mechanism and cross-subsidies, which hide the true cost signals from the customers. Psychologically, customers accept the current cost level and small, gradual improvements do not seem interesting, although saving an average of ten cents on 240 billion transactions adds up to a considerable total saving. The expected efficiency gains of e-invoicing are calculated to be more than 100 billion euro per year in the EU15 area alone, if and when company invoicing processes can be streamlined. Small efficiency gains per transaction do not catch the interest of the general public in the same way as spectacular robberies or massive processing errors.

6 Price mechanisms in payment instruments

6.1 General pricing conventions for payment services

Payment services show quite complex pricing structures to cover the costs for transporting the funds. The main reasons for this are the number of parties involved, the number of different instruments, traditions and different forms of bundling, cross-subsidisation and hidden pricing. It is the three last conventions that hide the true price signals from users and thereby make it difficult to compare the services offered in order to select the most efficient way of paying.[29] These non-transparent pricing methods together with network effects and monopoly institutions in the service chain prevent normal price and service competition from functioning properly.[30] Transparent pricing is needed in order to support the emergence of more efficient payment habits.

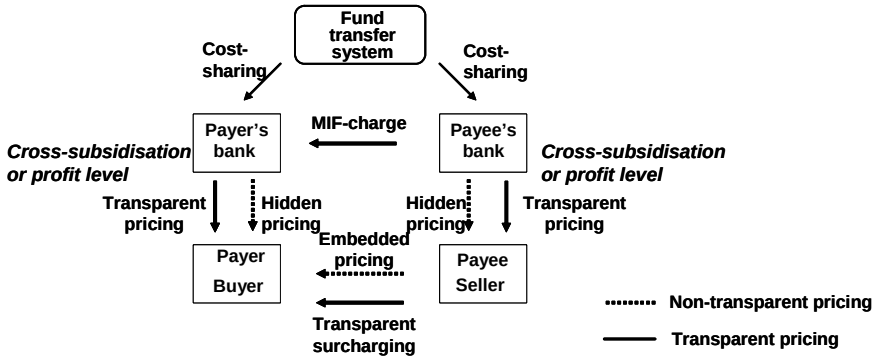
Figure 6.1 shows the general design of the pricing structure for payment services. The banks in the process charge their customers transparently or non-transparently for the services provided. Transparent charges in the form of transaction prices and monthly fixed costs are generally increasing, while the traditional non-transparent pricing in the form of a value-date-based float is decreasing as payment processing becomes faster. Private customers are also charged non-transparently for payment services via merchants, as these (payees/sellers) embed the charges and costs for payments in the prices of their goods and services. Merchants' average costs for payments are thereby included in every purchase. They could have the option of surcharging separately for the costs for paying, but that is still quite seldom the case. Some card service contracts even forbid merchants to surcharge separately, which hinders transparent pricing, especially for credit cards for which the merchants often pay 3–5% of the payment value as a merchant fee to the payee's bank.[31]

[29] Enge (2006).
[30] Bergman (2003).
[31] European Commission (2006a) and (2007a)

Between banks, credit transfers are generally passed on without interbank fees. However, for debit instruments, cheques, direct debits and card payments, an interchange fee, often referred as a multilateral interchange fee (MIF) is agreed among the banks involved. The MIF, if any, is generally paid by the payee's bank to the payer's bank, thereby reducing the need for the payer's bank to charge the payer directly. Instead, the payer will be charged via the embedded payment costs in the prices of purchased goods and services, as the payee's bank includes the MIF charge in their merchant charges, and the merchants in turn include this cost in their prices for goods and services.

Clearing centres or payment networks have been established to transport payments between banks. These generally charge the participating banks on a cost-sharing basis. However, as these monopolistic institutions change from structures driven/owned by the community of users into public companies, there is increasing interest in profit mark-ups. Their monopoly position obviously restricts normal competition in price and service developments.

Figure 6.1 **The general pricing structure for payment services**



6.2 The level of embedded payment tariffs in the prices of goods/services

Banks pass some of the costs for providing cash and card services directly on to consumers. However, a large part of the costs are covered via tariffs levied on merchants, who embed these costs as general average mark-ups on their consumer prices for goods and services. The level of embedded tariffs probably varies greatly, or at

least to some extent, from country to country, due to the large differences in national card[32] and cash[33] tariffs. The Finnish situation can be found in Table 6.1.

Table 6.1 **Merchant fees for cash and card services in Finland**

	Merchant fee	**Corresponding to**
Domestic debit card transaction	euro 0.05 per transaction	0.15% of the average transaction value
International debit card transaction	0.33% of payment value	
Cash	0.6–1.0% of payment value (cash services total)	Average ATM fee of euro 0.52–0.86 for an average transaction of euro 86
Low-cost charge/credit cards	1.0–1.2% of payment value	Interest rate of 10–12%pa for, on average, 45–48 days' credit
High-cost charge/credit cards	2.7–4.0% of payment value	Interest rate of 27–40%pa for, on average, 45–48 days' credit

The data in the table is based on banks' public tariff information for bank and low-cost credit cards and merchant information for cash and high-cost cards.[34]

In 2006, these prices result in an estimated total payment mark-up of EUR 240–330 million for all card and cash payments in Finland on a total payment value of about EUR 50 billion, resulting in a current average mark-up of 0.5–0.7% in consumer prices.

The typical result due to these hidden mark-ups is that consumers regard cash as a free and efficient payment alternative, although it is clearly more expensive than debit cards when the hidden price component is included. In the same way, consumers regard high-cost credit cards, in particular, as favourable, as, in addition to free credit, they also get various kinds of bonus points. However, compared with the average level of interest on direct consumer credit from their own banks of 6–8%, these card credits are quite expensive for the consumer. However, the convention of embedding these costs hinders the correct price signals from reaching the customer. Because of the

[32] European Commission (2006a) and (2007a).
[33] There are not yet any comparisons available on merchant cash fees in Europe.
[34] See web-pages of Finnish banks and www.luottokunta.fi.

general average mark-up used by merchants, who are generally not surcharging payment costs in Finland, the users of low-cost payment instruments are cross-subsidising those using high-cost instruments.

6.3 The tradition of cross-subsidisation and its consequences

The tradition of cross-subsidising payment costs dates back to when cash was the dominant, in fact almost the only payment instrument. As everybody was paying with cash, no separate charges were necessary. In banks, there was no alternative to tellers in branches, as almost all transactions were cash deposits or withdrawals. Cross-subsidisation requires that the costs for providing seemingly free-of-charge services are covered by the income from other services and their users. The costs of payment services have traditionally been covered by banks through larger interest margins, ie by depositors and borrowers.

In a situation with competing payment instruments operating at different levels of efficiency, the tradition of cross-subsidisation has several negative consequences:

- all payment methods seem equally efficient to the users, as there are no visible price differences and users can therefore not select the more efficient methods
- users have no incentives to economise on seemingly free services
- users have no economic incentive to change their payment behaviour
- it is difficult to introduce new payment instruments to the market when there will not be any direct chargeable returns
- it is difficult for new competitors to enter the market with new services, as there is little opportunity to compete with seemingly free services
- customers begin to view free-of-charge services as customer benefits and strongly oppose any pricing attempts, leading to a stalemate situation where no bank can risk making the first move to reduce cross-subsidisation and increase transparent charges
- service providers start to increase cross-subsidises by introducing bonus points, free bundled services or other positive incentives for customers in order to encourage the use of favoured payment methods, which further hides the true cost relationships.

In times with large development opportunities, transparent full-cost pricing without subsidies can promote efficiency. Transparent cost-based pricing is, in fact, necessary in order to reduce the costs of paying by moving to more efficient payment methods. For example, as long as customers perceive cash as a free service, banks will have to maintain expensive ATM and branch teller networks. Both banks and merchants will need to maintain expensive cash transportation services. However, since there is no such thing as a free lunch, customers in the end pay for the inefficient services.

Some time ago disposable bags were available free in most shops, and customers had no incentive to economise on their use. However, the costs of this seemingly free item were of course embedded in the prices of all merchandise. When merchants began to charge for the bags, customers were initially opposed. However, nowadays aware consumers are calling for extra duties or taxes on these bags in order to reduce disposable waste. Hopefully, consumer awareness will in future also extend to payment services, thereby launching the process towards more efficient payment habits.

6.4 The need for an interchange fee, and its efficient level

A much-debated issue in payments is the multilateral interchange fee (MIF). MIFs are used particularly for card payments, and to some extent also for direct debits and cheque payments. The purpose of the MIF is to transfer income from the payee bank to the payer bank. The payee bank will charge the payee/merchant a fee, which includes the interbank MIF charge. The introduction of an MIF for a given payment instrument makes this a basic minimum fee for the payees, and thereby a guaranteed minimum income for the payer's bank. Merchants can either accept the charge or refuse the payment instrument. When the merchant accepts the instrument he has to embed the costs in the prices of his merchandise. The two-sided market theory points out that in many cases it is easier to directly charge one side of the market in this kind of constellation.[35] This also seems to be the case in payments. For example, merchants seem to be more willing to pay for card payments than cardholders are, although

[35] Rochet and Tirole (2004), Evans and Smalensee (2005), van Hove (2005).

in the final analysis it is the cardholders who will pay the bank fees via the mark-ups embedded in the merchandise.

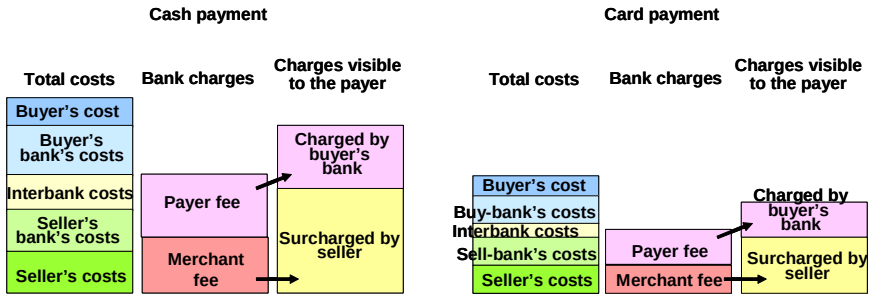
Because MIFs are agreed collectively among competing service providers, they are a horizontal pricing decision among competitors. According to competition law, this can only be allowed when it is beneficial to the general public. However, it is only under very special circumstances that a card payment MIF from the payee's bank to the payer's bank can be beneficial and promote efficient payment instruments:

– cash and other inefficient payment instruments are largely cross-subsidised, ie the more efficient card payment instrument cannot be priced more favourably
– the payer's bank's extra costs for providing card services is so high that it would be better off not providing card services at all (just, for example, cash services).

The following presentation seeks to describe in a general way the different situations by comparing cash payments and card payments schematically, the objective being that customers select the most efficient payment instrument, ie the one with the lowest total costs.

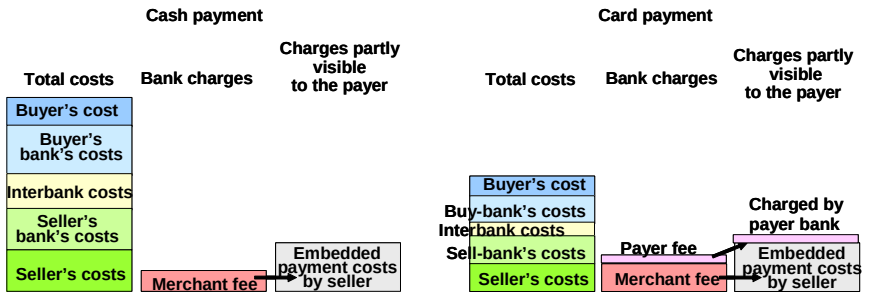
If all payment services were priced transparently at cost, there would be no need for an MIF, because customers would anyhow select the more efficient instrument. Customers could directly see which instrument is the most beneficial, because all the different costs would be transparent (see case 1 in Figure 6.2). We should point out that in this schematic picture the card payment is more efficient (= the total costs are lower), but under other circumstances it could be that the cash payment would be more efficient (for example, large payments versus smaller payments). However, this first case is today merely hypothetical, as cash payments are heavily subsidised.

Figure 6.2 **Case 1: Transparent pricing of cash and debit cards**



Case 2 in Figure 6.3 presents exactly the same cost structure for cash and card payments as in case 1. However, banks are now strongly cross-subsidising both payment instruments. In this case, the charges are such that both the buyer/payer and the seller/payee benefit from using the more efficient instrument. The buyer's and seller's banks' costs will also decrease if the customers select the card payment alternative. In this situation we have a perfect balance in a subsidised situation, which promotes the efficient instrument even without an MIF.

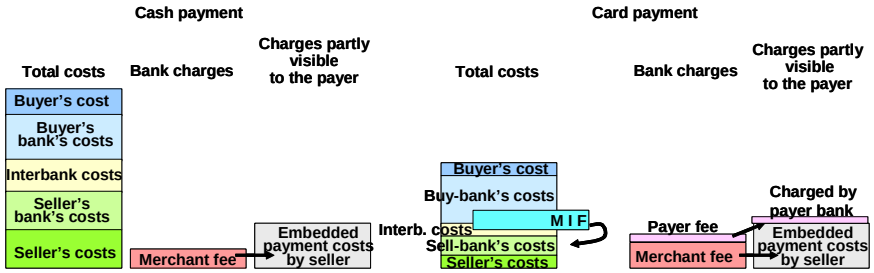
Figure 6.3 **Case 2: Cross-subsidisation with charging levels making the efficient alternative beneficial**



An MIF can be an efficient pricing method if we have a less balanced situation. One of these is described in case 3 in Figure 6.4. The total costs are still the same for both instruments. However, the costs of the buyer's bank are notably larger for card payments than for cash payments. The bank could not pass the difference on directly to the

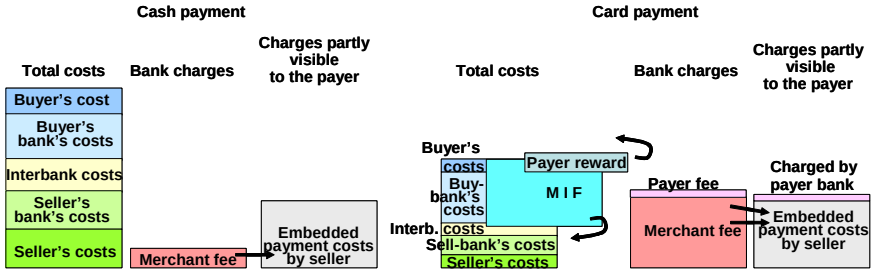
buyer, because, due to free provision of cash services, the buyer would refuse the card. However, in our example, both the seller's bank and seller have lower costs for cards than for cash, and the MIF can be used to cover the higher costs at the buyer's bank in such away that card payments would become beneficial to all parties. An MIF would be efficient in this kind of situation where it can balance cost structures in such a way that the most efficient instrument becomes the preferred option even with subsidised prices.

Figure 6.4 **Case 3: An MIF balancing a structural cost barrier**



However, in an actual case, it is very difficult to determine what constitutes an efficient MIF. As MIFs are agreed collectively among service providers, they have an interest in selecting quite a high MIF. An over-sized MIF would result in supernormal profits for the payer banks, as they would receive much higher income than their normal costs for card services, as described in case 4 in Figure 6.5.

Figure 6.5 **Case 4: An over-sized MIF resulting in supernormal profits**



Both banks and competition authorities have difficulties in determining the normal costs for the different payment instruments, whether an MIF is needed and how large it should be. There are difficult problems of cost methodology involved, eg sharing fixed costs among services, investment periods, technology levels and cost differences among service providers. However, several competition authority studies point towards the use of excessive MIFs and supernormal profits, especially in the credit card industry. There has also been a trend towards establishing higher MIFs, although the processing costs of card systems are continuously decreasing. This has led several competition authorities to limit or forbid the use of MIFs.[36]

High MIFs have also been used to provide bonus points and free credit and other services to cardholders, which increases buyer's/payer's banks' costs. The idea has been that high bonuses would stimulate use of a particular card. However, the higher the bonuses, the higher the MIF needs to be, and thereby the merchant fee, which at some point will result in merchant refusals. This can clearly be seen in the acceptance of debit and credit cards among merchants. Countries like the Nordic countries, with low merchant fees on debit cards, have much larger card volumes than countries lacking low-tariff debit card schemes.

Cross-subsidisation of inefficient instruments, together with high MIFs on efficient instruments, results in support for inefficient instruments. Customers using the efficient instruments are paying extra so that the users of inefficient instruments can continue using their subsidised instruments without having to pay for the inefficiency.

6.5 The effects of bundling services

The most transparent way of pricing fund transfers would be transaction-based pricing. There are good examples in the Nordic countries of how even small charges per cheque can lead to a rapid reduction in volumes, and how paper-slip charges encouraged merchants to adopt efficient EFTPOS equipment for card payments. However, pricing small items separately results in some extra work that can be avoided by pricing based on bundling. A fixed monthly fee for a free or limited amount of transactions is often regarded as a simple and straightforward charging convention. It is also interesting

[36] MacFarlane (2005), Office of competition and consumer protection in Poland (2007), European Commission (2007a).

to the customer when the cost for the bundle is lower than the price of separate transactions.

The situation becomes more complex when other services are included in the bundle. Private customers are often offered credit and cards in the same bundle. Merchants are offered different kinds of cards (debit cards, credit cards, premium cards etc) at the same average merchant fee. Private customers can be offered a bundle of different services (eg e-banking, direct debit, debit card services) in one package. Private customers can also be offered free payment services when they have a large credit or investment portfolio. The content of portfolios and pricing parameters can vary across banks.

These kinds of bundles limit competition and make efficient service choice difficult

- customers will not see the marginal costs of the different payment instruments
- customers have difficulties in comparing different offers
- customers cannot shop around for different items of interest
- cross-subsidisation among products and customer segments will increase.

These kinds of complex pricing mechanisms seem common for different kinds of network services (compare, for example, with the pricing of mobile telephone services). They also seem to be common in industries that are undergoing a transition from regulated or public services to free markets and therefore have to change their pricing conventions to suit a competitive environment. The pricing conventions will probably become closer to those of other, more competition-based industries when the payment industry is opened up to more internal and external competition.

6.6 Summary of pricing issues in payment services

Typical in the pricing of payment services are cross-subsidisation and hidden pricing mechanisms, although there is a slow development towards more transparent pricing conventions. Both cross-subsidies and non-transparent pricing mechanisms hide the true cost information from customers and make it difficult for them to select efficient instruments. This in turn results in higher payment costs for society than necessary. Interchange fees, which are typical especially for card

payments, can in some situations be employed efficiently, but they can also be used to increase service provider profits based on collective agreements among competitors. Increased transparent pricing is necessary to speed up developments towards more efficient payment habits. This is also in the interest of the consumer, although reducing hidden pricing might at first sight look like price increases. Open competition with negotiable and visible prices has been proved to be a good way to lower overall charges.

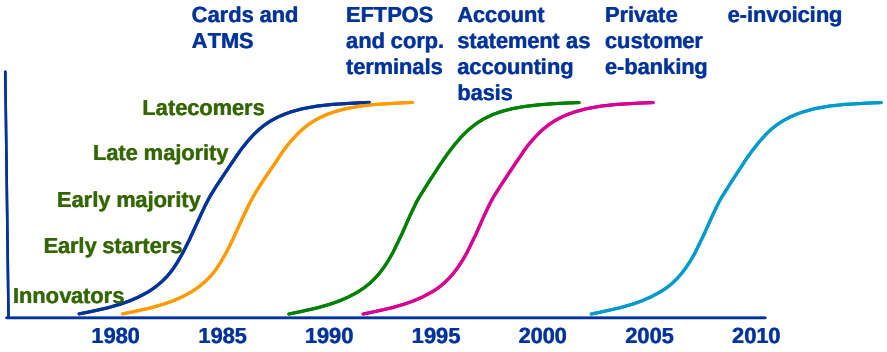
7 User views and requirements for future developments

This chapter is mainly based on Finnish user/user group interviews, surveys or presentations made during the Payment Habits 2010+ project. However, the responses are probably also representative for other countries and especially those with high electronification levels or clearly heading towards increased use of e-banking.

The adoption of new payment instruments and habits by users has in Finland followed the general s-shaped adoption pattern common in many industries.[37] There have been several major changes during the last 20–30 years (see Figure 7.1). Payment cards and ATMs were introduced in parallel from the late 1970s/early 1980s, which also resulted in rapidly shrinking use of cheques. EFTPOS and corporate terminals were introduced from the early 1980s onwards. This reduced the use of paper slips and magnetic data media, which were replaced by data communication. At the end of the 1980s a common electronic account statement was introduced, which was recognised in Finnish accounting legislation as an acceptable basis for accounting and as part of an electronic general ledger. Private customer e-banking began in the 1990s, and the Internet boom supported this development. E-invoicing is in the early phase of use for corporate customers and has also just been introduced to private customers. Typical for all these instruments has been the achievement of saturation levels of about 80–90% within about 10 years from their launch.

[37] Snellman and Vesala (1999), Snellman, Jussi (2000) DP, Jyrkönen and Paunonen (2003).

Figure 7.1 **Major payment service developments in Finland during the past 30 years**



It is evident from the above that the emphasis in payment developments has shifted from bank-centred developments towards developments in customer integration. Further cost savings and efficiency gains can mainly be found from customers' payment processes and customer-to-bank interfaces. This requires good cooperation between banks and customers, which has a long tradition in the Finnish payment industry.

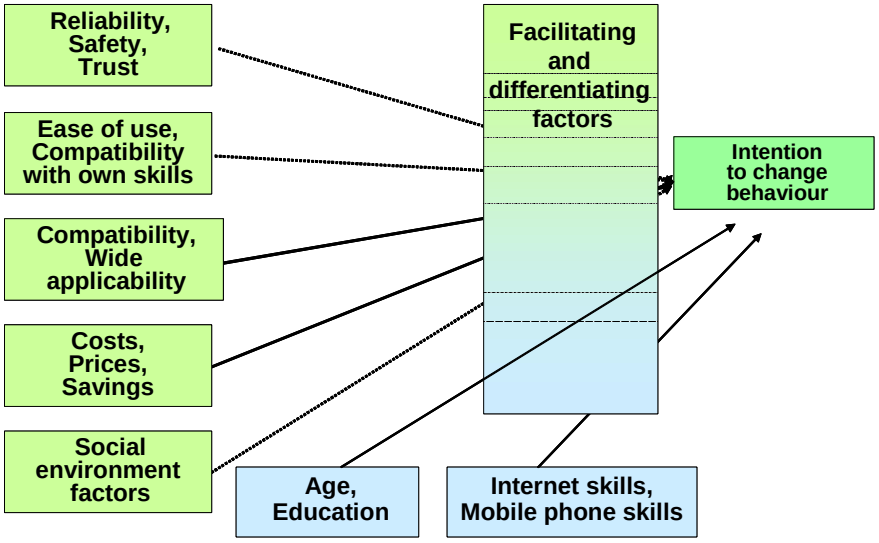
7.1 Private customers

The Bank of Finland conducted two studies, one group interview[38] and one questionnaire[39] aimed at the general public regarding private customers' views on current and future payment habits and payment service development needs. The general findings were that customers do not expect their payment behaviour to change drastically in the coming years. Customers are generally quite content with the current services and tend to change their payment habits quite slowly. It should also be noted that it is difficult for customers to assess the impact of technology on their future payment habits. For example, awareness of SEPA was still very low when the survey was conducted in late 2005. However, 16–45% of respondents believed their payment habits will change during the next five years.

[38] Keinonen (2007).
[39] Dahlberg and Öörni (2006).

There are several factors affecting the adoption of new payment habits (Figure 7.2). A particularly interesting observation was that customers need several simultaneous reasons to change their behaviour before actually deciding to change. For example, service advantage, compatibility and cost efficiency need to support the change at the same time. One reason alone seems not to be enough to motivate change.

Figure 7.2 **Adoption factors for new payment habits**



Source: Dahlberg and Öörni (2006).

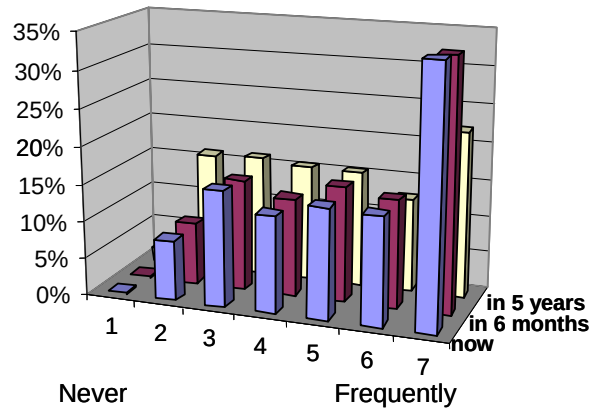
The questionnaire was sent out in October–November 2005 to 2,000 random citizens in the age range 20–65 years. A total of 960 replies (48%) was received, which is a very good result for such a complex questionnaire. Most questions asked respondents to state their current payment behaviour and assess the changes in 6 months' and 5 years' time.

Practically all customers today are using cash, but there is a clear indication that usage is expected to decrease over the next 5 years (Figure 7.3). Based on a small sample survey[40] conducted in bank branches, cash withdrawals at branches are mainly by pensioners and for their daily purchases. The same sample survey showed that there are different niche usages for high denomination notes, especially 500

[40] Preliminary results can be found on the Bank of Finland website at www.bof.fi/sc/payhabits2010.

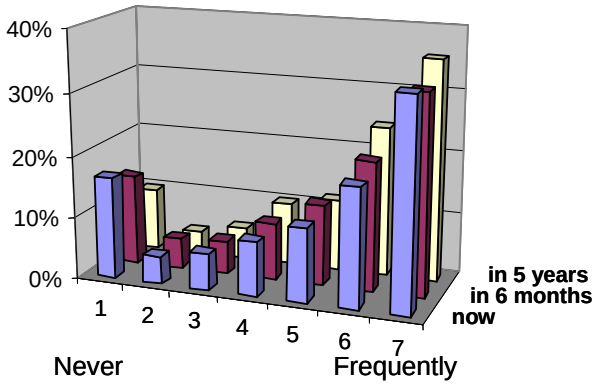
euro notes, for example in purchases of second hand cars and in the housing market.

Figure 7.3 **Consumer expectations on cash usage**



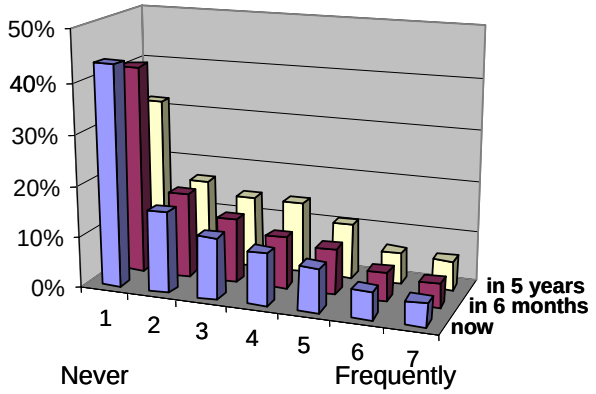
The use of debit cards seems to have almost reached saturation point (Figure 7.4). More than 85% of consumers use debit cards, and the penetration level is expected to increase in future to close to 90%. They will be in frequent use (answers 6 and 7) by 60% of the population.

Figure 7.4 **Consumer expectations on debit card usage**



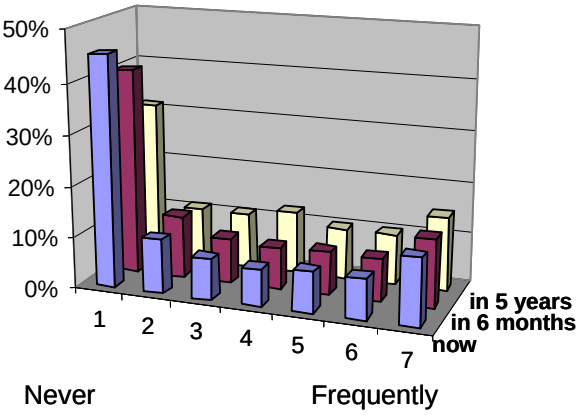
The use of credit cards is quite low in Finland, with only about 58% of consumers having a credit card and less than 10% using them frequently (Figure 7.5). Only rather small growth can be noted.

Figure 7.5 **Consumer expectations on credit card usage**



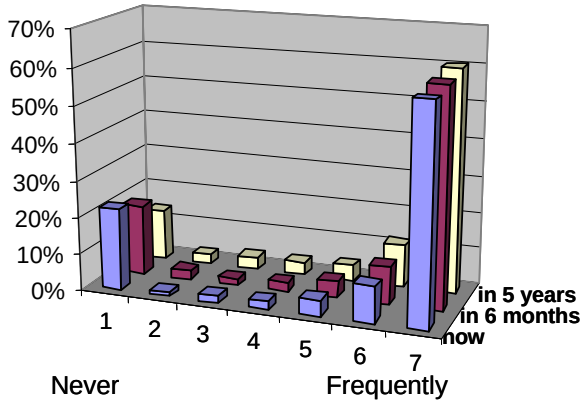
Direct debits are only moderately used in Finland (Figure 7.6). A small increase can be seen in the future as the share of non-users is decreasing from about 42% to 32%, but the number of frequent users remains almost unchanged.

Figure 7.6 **Consumer expectations on direct debit usage**



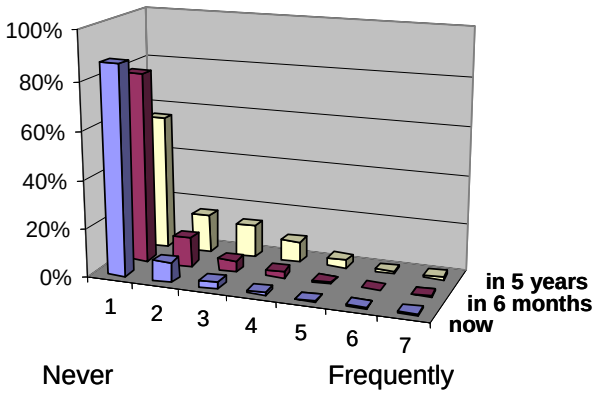
The e-banking penetration rate among consumers is very high, at 80%, and increasing towards 85% (Figure 7.7). The frequency of use is also remarkable, with about 70% reporting themselves as frequent users. It is also very much an on-off distribution between very frequent users and complete non-users.

Figure 7.7 **Consumer expectations on e-banking usage**



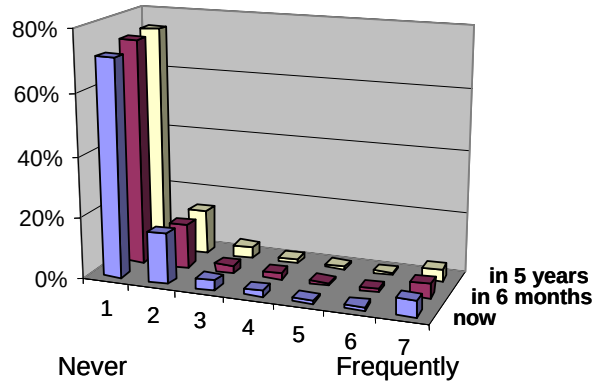
Some customers are already using mobile phones for making payments, but only about 15%, and even then very infrequently (Figure 7.8). However, consumers expect usage to grow, not as a frequently used payment instrument, but for special situations. In Finland mobile phones are currently used especially for parking and public transport in some cities. Consumers do not envisage any large growth in the coming years.

Figure 7.8 **Consumer expectations on mobile phone payments**



Interest in the use of bank branches is very low in Finland (Figure 7.9). Less than 10% of the population use bank branches frequently for making payments, and more than 70% say they never use bank branches for paying. This is in line with the answers on e-banking usage.

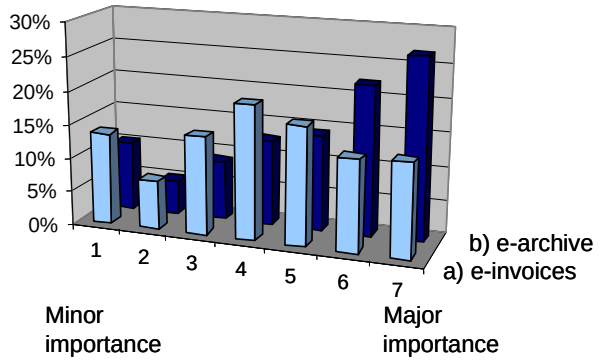
Figure 7.9 **Consumer expectations on the use of bank branches for making payments**



Consumers expect e-invoicing to grow considerably in the coming years (Figure 7.10). This is a rather surprising finding against the background that e-invoicing had not yet at the time of the survey been actively marketed to private customers. E-invoicing has been launched in Finland as a business-to-business service provided by the banks or

independent invoice hotels. Consumers, however, require more e-archiving services for their invoices than they can get with the pure e-invoicing service. An easy-to-browse electronic archive to manage their invoices seems to be seen as very important (answers 6 and 7) by two thirds of customers. E-invoicing is seen as important by about a quarter of customers.

Figure 7.10 **Consumer expectations on the use of e-invoices and e-archives**



The study shows very small differences between the different age groups. Consumers over 60 years of age are somewhat more likely to use branches and cash payments than other age groups. They are also less ready to change their payment habits and seem to be content with the current situation. About 46% of them use e-banking. Meanwhile, in the age group below 29 years old, 92% use e-banking. Younger consumers are also more interested in changing their payment behaviour than consumers on average. This is partly attributable to them starting their working life, and their economic situation is therefore changing. The variations in the age groups in the range 30–60 years of age seem to be very small and random.

Other interesting individual findings were:

– consumers can to some degree accept separate charges for different payment methods (36% agree and 43% disagree)
– if separate fees were introduced these should be transparent (67% agree and 17% disagree)

- direct price differences in the range of 10 cents per transaction (or 1% of transaction value) would trigger payment habit changes for about 45–55% of customers, while price differences in the range of 50 cents per transaction (or 2.5% of transaction value) would trigger changes for about 75–85% of customers
- current Finnish delivery times of 1–2 days are satisfactory for about 47% of customers, while 43% would like to see improvements
- the security of payment instruments is very important to all customers, and banks should immediately correct any errors due to fraud or failure
- a substantial majority (59%) of customers would be interested in a portable account number (ie the possibility to move account number from bank to bank in the same way as mobile telephone numbers can be switched between telephone operators), while 27% find this to be of less importance
- customers seem to be loyal towards their domestic banks, as about 85% stated that they are not interested in opening an account in a foreign euro-area bank; however about 30% expressed an interest in opening an account with an international Internet-payment provider such as PayPal
- although customers directly named only a few development needs, they held the general view that payment systems require further development (almost 40% agree strongly and only 7% disagree strongly with the need for further development).

These findings of the consumer surveys point towards a continuation of the statistical trends presented in Chapter 4. Use of cash will continue to decrease and will be replaced by account-based payments, and especially their electronic versions. Consumers do not foresee any radical changes during the coming five years, only gradual changes. However, e-invoicing might cause faster change. More direct cost-based and transparent pricing would probably also accelerate changes, as even small differences in price would make customers more interested in new alternatives operating on a lower cost-level.

7.2 Corporate and government customers

Corporate and government customers' payment needs relate mostly to paying bills or receiving payments for bills which they have sent out. In addition, corporate customers have a large volume of salary payments. Government customers pay bills and receive mass payments for public utilities etc. Tax payments and various kinds of public allowances make for larger public payment volumes. However, the basic requirements on the payment instruments are the same for private and public institutions. Corporate and government customers can be categorised in three groups based on their payment volumes:

– large volumes of business-to-business invoices
– mass consumer billings
– low-volume SME invoicing.

Today, corporate customers' most important payment service requirement is efficient electronic integration with banks' payment systems. These interfaces need to be well standardised, as most large and medium-sized enterprises bank with several banks and want to use the same interface with all their banks. The interface and accounting software used by corporate customers is mostly provided by external software companies, and, in order to ensure plug-and-play start-up, common interface standards to all banks are essential. The basic electronic and standardised interface services required by companies of any size are:

– sending normal payments and salaries
– receiving automatically reconcilable payments
– receiving bank statements in a form directly usable for accounting bookings
– receiving and sending electronic invoices
– receiving bank charges as electronic invoices
– on-line liquidity information
– rapid payment processing with a given delivery time
– standardised communication interfaces
– standardised identification and authentication solutions.

Most corporate customers today have all their payables in their ICT systems and therefore need an efficient interface to send these automatically to their bank for payment. Salaries are also calculated by payroll applications. These were often the first applications with

electronic interfaces back in the 1970s, based on magnetic tapes or other magnetic media for large companies. However, nowadays even a large proportion of SMEs use automated direct interfaces either themselves or through their outside accountants.

Companies with mass billings, especially to consumers, need an electronic interface that supports automatic reception and reconciling of the associated payments. In Finland and other Nordic countries, structured reference information has been available since the 1970s. This is an individual numeric code with a check digit that is created by the invoicer and included in all invoices in order to identify the invoice and the payment associated with it. The payer states this individual reference code for all payments when paying, and it is transferred via the banking system to the receiving invoicer, who can then use it for automatic reconciliation his receivables file against the received payments.

Each company's bank statement contains important information for the company's general ledger and needs to be reconciled against its internal bookings on the bank account. When the electronic bank statement is well standardised, companies can use it directly as input to their accounting systems. SMEs can use it directly as an accounting book when it is accepted by the accounting authorities, as is the case in Finland.

The latest addition to integrated services is the electronic invoice (e-invoice). Until recently, payment processing was separated from invoice processing. The increased low-cost possibilities for data communication and storage have made it possible to re-engineer payment and invoice processing and benefit from synergies in these processes. Customers can let their banks transmit the invoice information as part of the payment information, thereby reducing the need for separate invoice shipments. The reconciling of payments and invoices also becomes easier when the data is kept together all through the process. For service users, the re-engineered e-invoice process has one of the biggest potentials for cost savings, as was described in more detail in Chapter 5. The e-invoicing service itself is described in more detail in Chapter 9. One obvious development will be that banks themselves will also start to employ e-invoice standards in their own bank-charge invoices.[41]

Liquidity management in large and medium-sized enterprises has developed considerably during the last decade. Company treasurers require on-line liquidity information for efficient management of their

[41] See for example www.twiststandards.org.

funds. International companies need to reconcile their international positions and to reuse available funds on a global level.

The longer it takes to deliver a payment through the payment system, the longer companies will be unclear about their receivables. They will also lose interest on the float time. A short and certain delivery time of, for example, one day would already improve the situation considerably. However, immediate real-time information would support e/m-commerce payments and error processing. Immediate payments are available today in Finland within the same bank group, but not on the interbank level, except for specially priced urgent transfers. South Korea provides an example where all interbank transfers are immediate.[42] The United Kingdom, meanwhile, is moving towards rapid payment deliveries between banks of just a few seconds.[43] When payment processes become immediate, the payee gets a clear signal of final payment and can ship the goods against the payment. This is especially important in environments of the e/m-commerce type, in which is difficult to claim payments later. Immediate responses also improve error processing, as the sender of a payment will know directly if the payment was processed end-to-end or if some problems were encountered that require attention and correction. Immediate correction is much more efficient than making the same corrections some days later by reading batched error files and accessing the old payment files to see what the correct information should be. Immediate processing is also more efficient than batch processing in modern network-based process-to-process environments.

All payments to be received or sent need to be transmitted between the bank and customers over some kind of communication interface. These have lately been developing rapidly, especially as web services. All kinds of companies and applications interface each other over the Internet. Bank interfaces need to become a standardised part of this web community. If all banks would use the same standardised interfaces, it would be easy for providers of hardware, software and communication services to create and maintain secure e-banking interfaces for all their customers. Start-up, implementation and use would become easier, which would increase interest in e-banking. Some countries, for example Finland, have national standards, but the clear need for the future are global e-banking standards in the same way as we currently have global e-mail standards.

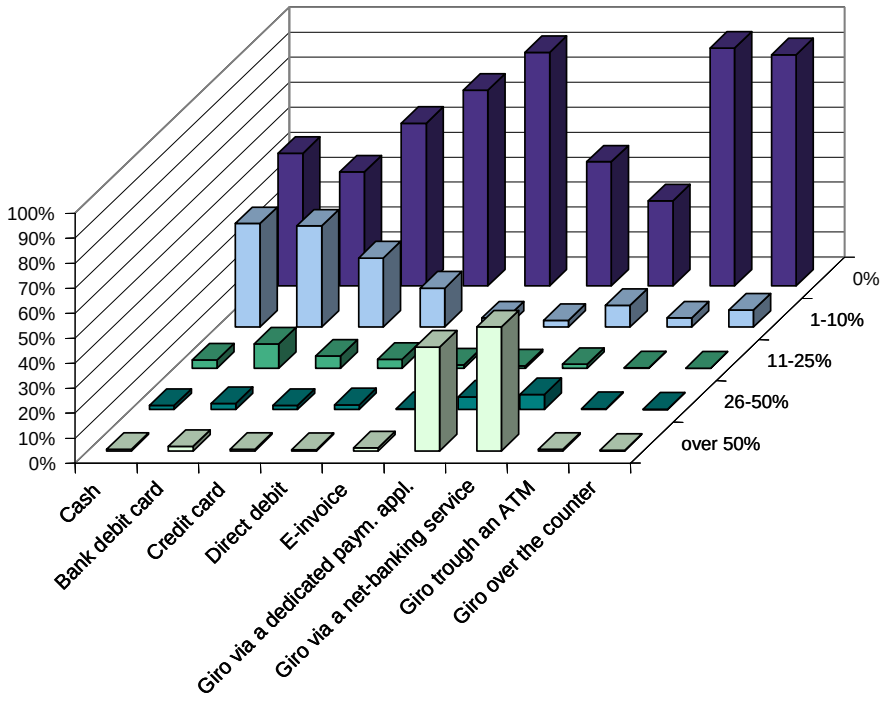
[42] See www.bok.or.kr Payment instruments and Fund transfers.
[43] See www.voca.com Faster Payments.

Banking and processing funds require good security measures to protect customers' and banks' property. Good encrypted communications are starting to become the norm in e-banking, but there are as yet no standardised solutions for customer identification and authentication of payments. Protection of customer sites varies considerably, and some are therefore vulnerable to various kinds of Internet attack, such as Trojan Horses, which can at their worst begin to make forged payments from the customers' accounts. These and other kinds of security threats are reviewed in more depth in Chapter 8. Due to the current non-standardised situation customers need different kinds of solution for the different banks, which makes connections less efficient and will often mean that start-up situations are more difficult.

A payment habit survey focusing especially on SMEs (small and medium-sized enterprises) was conducted during the project in November 2005. An email form was sent to 5,000 SMEs in Finland and 843 answers (16%) received in return. This is quite a high response rate for this kind of survey, as small companies have little time for any tasks other than their daily operations. Some 80% of these companies had less than 10 employees, 42% were providing services, 24% were merchants, 16% were in manufacturing and 13% were in construction. Turnover was distributed in almost equal thirds between those with turnovers below EUR 100,000, between EUR 100,000 and EUR 500,000 and over EUR 500,000.

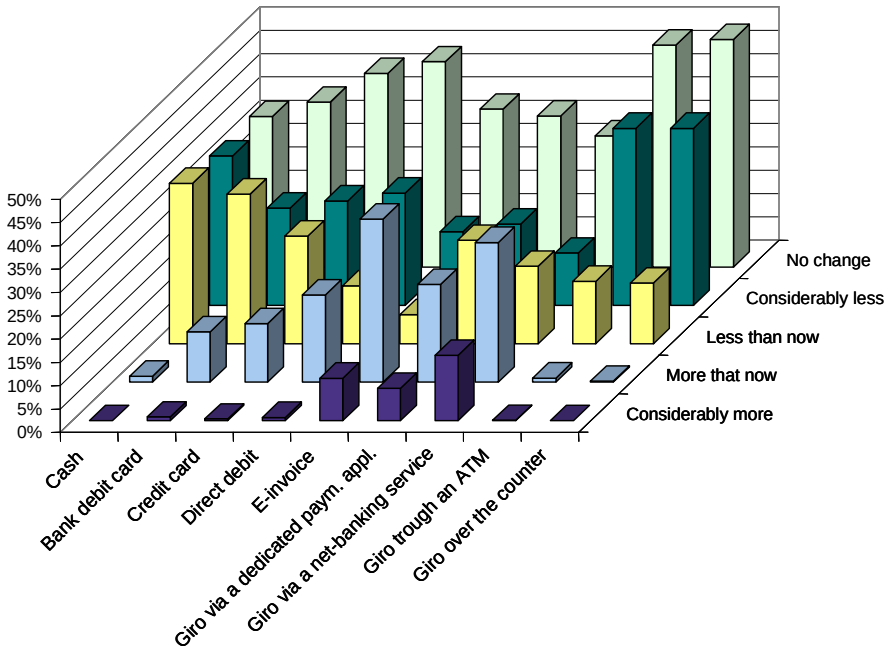
The main payment method for SMEs in Finland is credit transfer via some e-banking solution: a dedicated application or just a web interface provided by the bank (Figure 7.11). SMEs very seldom use bank branches or payment ATMs.

Figure 7.11 **Primary methods used by SMEs for making payments in Finland in 2005**



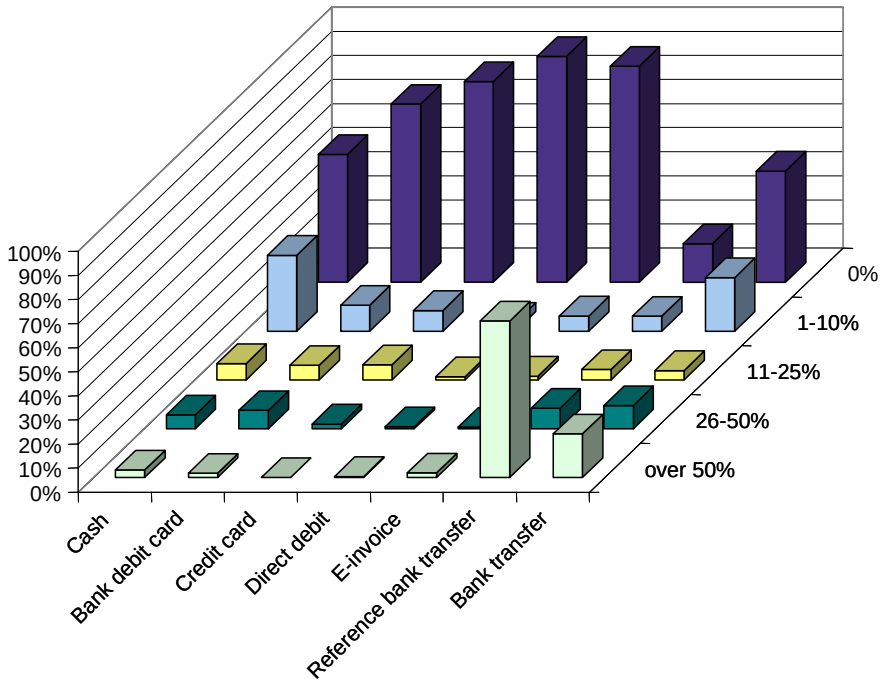
When SMEs were asked how their primary payment methods for sending payments would change during the next 6 months, the answer was that e-banking would grow quite strongly, as would e-invoicing (Figure 7.12). The use of bank branches and payment ATMs were the service forms that would decrease the most.

Figure 7.12 **Changes in primary methods used by SMEs for making payments in Finland in 2005**



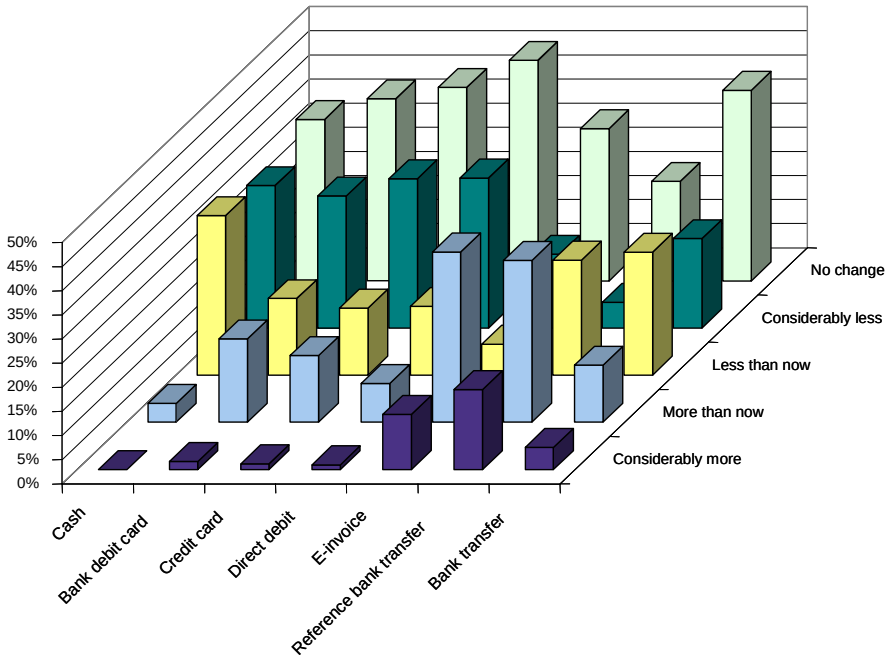
The reference giro, which is a credit transfer with structured reference information for automatic reconciling, is the main payment method for payment reception among SMEs (Figure 7.13). All others are considerably less important. The next in importance after the structured credit transfer is just a normal credit transfer with the payer's name and a free-format text field as the reconciling information.

Figure 7.13 **Primary methods used by SMEs for receiving payments in Finland in 2005**



When SMEs were asked how their primary methods for receiving payments would change during the next 6 months, they indicated their use of structured reference credit transfers would grow still further, but in addition to that their use of e-invoices would also increase considerably (Figure 7.14). In 2005, about 10% of SMEs were already using e-invoicing. Cash and normal credit transfers were the payment instruments for which the strongest reductions can be noted.

Figure 7.14 **Changes in primary methods used by SMEs for receiving payments in Finland in 2005**



Other findings of interest were:

- SMEs clearly prefer package pricing (52%), with only a third (34%) preferring transaction-based pricing; almost all (90%) wanted transparent pricing
- 14% of SMEs found that transportable account numbers were very useful, 39% found them useful, and 47% found them useless
- the main reasons for moving to e-invoicing were processing speed, less manual processes, reduction of errors and automation of accounting
- of SEPA services, the general introduction of IBANs was seen as the most beneficial, while the international direct debit service was seen as the least interesting new international service
- payment delivery time should be short, preferably less than 1–2 days.

Government users found it important that sufficient information flows in both directions and that structured information fields are available and transmitted. The current level of automation is high and cannot be

maintained in SEPA without well-structured data. Direct debits are important, especially for taxation authorities and public utilities, and they have to be final after processing.

All groups of corporate customers find it important to be included in discussions on payment system developments, as the main benefits of future developments will lie in bank-to-customer interfaces and integration.

7.3 Merchant customers

Merchants' needs are presented here in a separate section, as direct consumer-to-merchant payments are most often connected to an immediate service process.[44] Their needs therefore differ from the billing situations covered in the previous section. Merchants can be divided into the following categories depending on their payment instrument needs:

- supermarkets
- specialist stores
- entrepreneurs
- mass-ticketing points
- kiosk-type outlets
- vending machines
- Internet stores.

Supermarket cashiers handle a large number of payments each day; the payments are of moderate value, and the time it takes to make each payment affects the efficiency of the cashier. In specialist stores, the time used in paying is less important, as its share of total customer service time is often small. The average transaction values in specialist stores are mostly above the general average. The number of entrepreneurs is large, but their average billing volumes are rather limited. They are interested in ensuring in a simple way that they receive their payments. In mass-ticketing points, the emphasis on payment efficiency is very high, because the time it takes to pay represents a very large share of the total customer service time. Kiosk-type outlets often sell single items (newspapers, tobacco, confectionery etc) and need a high level of payment efficiency,

[44] These merchant views have been received via the SME questionnaires, through interviews and from Finnish merchant organisations.

especially for small value payments. Vending machines need payment instruments suited to self-service in an easy-to-use, secure and reliable way. Internet stores and other e/m-commerce outlets require electronic payment solutions for remote self-service.

The different use environments put different emphases on payment instrument efficiency, but common requirements are that the payment method should be economical, easy-to-use both for the payer and for the merchant, secure and reasonably fast. Cash and cards are the main payment instruments used by merchants. Cards and other modern payment methods have to compete with cash and have therefore to provide benefits over cash.

Although cards are more efficient than cash in most situations, merchants have several concerns regarding card payments:

- the rules and responsibilities change for card payments and they also vary across card products (when the rules for cash have long traditions and are often stated in law)
- charges on merchants seem to increase for card usage without any good reason, and there is a need for competition authorities to pay more attention to interbank decision-making and monopolistic or quasi-monopolistic service providers
- cardholders should be charged more transparently and the embedded payment charges in merchant prices reduced
- increased competition is needed in the card industry, but current developments seem to be going in the opposite direction
- technical standards are changing and, although there are common standardised parts, it is the non-standardised parts that create extra costs (eg EFTPOS terminals should function in line with plug-and-play expectations and need to be long-term investments)
- card payment credits to merchant accounts are often difficult to reconcile against actual sales due to a lack of standardised credit reporting and coding for automatic reconciling against payment batches
- merchants are needed to ‘teach’ customers to use the new payment instruments and terminals, and this should be noted in the design of the products and their implementation (the euro and EMV introductions are good examples)
- merchants wish to be involved in future developments regarding point-of-sale payment instruments, as these will have a profound effect on merchants’ processes for paying and all future payment instruments will need to be highly integrated with other merchant processes

– the general objectives of SEPA are important and the project should be supported; however, regarding card services, progress seems to be slow, may retard developments in some countries and seems to harmonise merchant fees upwards without providing any concrete benefits to merchants.

Cash will still survive for many years, but the market share of card payments will increase. Technically, the use of cards should be developed to be faster for high-volume environments. Transport ticketing, in particular, needs more efficient payment solutions than cash and could be one of the drivers for new solutions. For entrepreneurs and other low-volume environments, card terminals will need to become cheaper to be interesting. Mobile payments might be an interesting new payment method for the future, but deep development cooperation is needed if the objective is to be rapidly introduced.

7.4 Summary of user views and requirements

The users' views for all user groups can be summarised in the following bullet points:

– payments need to be automated and electronified for the network environment
– payment interfaces and messages need to be standardised, as do communication and security methods for e-banking
– efficient integration of banks' and users' payment processes is essential, and e-invoicing is the best example
– the price elasticity for payment services is high and transparent pricing, where applied, has and would have a great impact on the selection of payment methods
– the rules and responsibilities for users regarding payment instruments need to be clarified
– users want to be included and have their voice heard regarding future developments, as these should always include user integration aspects.

8 Technology developments and their impact

Payments are very much a data transfer and processing industry in which the only, but very essential, addition to basic data transfer is the inclusion of monetary value. The data communication facilities have completely changed during the recent ICT revolution. Internet technology has literally created a world wide web of continuously communicating servers and PCs. All payment terminals will be able to communicate with each other and with the account databases, irrespective of distance and time. The payment and banking industry have started to use these new facilities, but until now only partly. We will therefore, in timeframe 2010+, see radical changes in the way the industry employs the new ICT possibilities. This chapter describes these new ICT possibilities and how they can be used to improve payment transmission and customer service.

The fundamental and important difference with modern technology is that the current payment systems were designed when the economic realities required economising on ICT resources. However, the rapid developments in increased technical capacity and decreasing costs have almost totally removed such considerations. Payment systems can now be redesigned in a completely different ICT environment. At the same time customer self-service capabilities have increased. However, both banks and their customers face completely new security risks in this open network environment.

8.1 Impact of low-cost mass storage capacity

The current payment systems and applications still draw on a large legacy of old storage technologies, for example batch-based sequential files and old types of database storage. Payment system would benefit considerably by moving to modern storage technology.

The first automated payment systems were designed when the main input media was punch cards, which meant that a record could contain at maximum of 80 characters of payment information. This limit on data content can still be seen in many payment applications. Although this limitation has been revised over the years in most systems to a somewhat larger number of characters, most modern systems have fixed limits on the available data content in the form of

rather small numbers of fixed data fields. What can now be done is to expand the data fields and data content of payments in general. Increasing the data content to an average of 1,000–2,000 characters would mean that the data of most invoices could be included in electronic character form. As pointed out earlier and described in more detail in chapter 9, adding complete invoicing data to payments would generate considerable synergies and re-engineering benefits.

The USB memory stick is a popular storage device for consumers. It comes in different sizes, but a common 1 GB (gigabyte) USB now (December 2007) costs about EUR 15 in Helsinki and can store about one million payments with an average size of 1,000 characters. The storage costs for one copy of a 1,000 character payment on a USB stick would then be about 1.5 euromillicents. If an average person would make 1,000 transactions a year, which is about four times the current average in Finland, the storage capacity of a 1GB USB stick suffice for 1,000 years of payments by one person.

When more storage capacity is needed then disk-drives are used. Today, a simple PC connectable 1 TB (terabyte) disk-drive costs about EUR 300 in Helsinki (December 2007). One terabyte of memory could store 1 billion 1,000-character payments. The storage cost for one copy of an average payment would then be only about 0.03 euromillicents.

One more example of the current storage capabilities can be calculated on the assumption of today's 60 billion cashless payments in the EU area. About 60 disk-drives would be sufficient for storing once this amount of data (60 billion transactions with an average of 1,000 characters – about 10 times the current average). If we assume that 10 copies of the data would be needed for back-up purposes, the capacity need would increase to about the capacity of 600 disk-drives. If the employed disk-drives are high-quality drives for online purposes, the cost increase by 2–3 times, but still the total required disk capacity for all yearly payments in the EU15 area would be about 600 TB and would cost only about 180,000 euros.

The original Moore's law (attributed to Gordon E. Moore) states that the number of transistors on a circuit board doubles every 24 months with no appreciable cost. The time period is also claimed to be only 18 months.[45] This same relation also seems to apply to the storage capacity. This would mean that the cost of storage capacity would by 2012 decrease 10–20% compared to the current costs of 2007.

[45] See www.wikipedia.com.

The appetite for enlarging the enclosed payment data would probably increase over the years. An additional 10,000 characters would make it possible to enclose details corresponding to three A4-size pages and an enclosure of 1 MB (megabyte) could already carry different brochures with pictures and logos. Yet these additions would cost only 0.3 millicents or 30 millicents for storage once on a disk. The same appetite for large enclosures exists for emails, most of which are short basic messages, but some contain book-size enclosures. We will probably see the same developments for payment enclosures as for emails, because the possibility to add enclosures provides interesting synergy effects.

The purpose of these calculations is to show that storage capacity is no longer a restricting factor; the data content can be freely expanded in order to raise the efficiency of other processes in the management of payments. For example, an electronic online archive with the exact status and necessary details on all payments would greatly facilitate all types of inquiries. Such online databases/archives can already be found eg for parcel shipments and for flight tickets.

The administration of databases has also changed from centralised databases in one site and for one application to distributed common databases used by a network of users, servers and applications. Generally separate data retrieval processes and servers are used for database access. This makes it easy to find the information anywhere in the network. Retrieval engines can now browse at comfortable access times and costs any interesting information from huge distributed database environments based on fairly inexact information and search according to any criteria as is done when using the popular web-browsers.

8.2 Impact of low-cost online processing

Many of the current payment applications are still batch-based and process payments in a long row of batch applications feeding batch files to each other. Errors may be detected far along in the process and must be unwound in a number of batch-processes tracing the payment back to its origin. The long rows of interdependent batches are difficult to control, especially in malfunction and other special situations. The delivery times become long as the different batch applications wait on the prior applications, settlement cycles etc before they can run. Earlier, the batch applications were the state of

the art processing method for large volumes, but the current move to online processing is rapid in all industries.

The situation started to change already in the 1990s, and the change was especially dramatic during the decade, although the first online/real-time applications date back to the 1970s. Online and real-time processing has become the most efficient processing method and the norm for all new systems. Online information helps to keep better track of the process and the inventories. Resources can be better employed. Just-in-time deliveries have become the objective in most industries. Online solutions can be found in all transaction environments. Merchants have online updated inventories. Flight tickets are booked online. Parcel mail keeps track of the items online. Public libraries keep online databases on their books.

For payments, online real-time processing would mean no payments in transit (no cheques in the mail). Customers and bank employees would get immediate feedback on execution or problems in the booking process. Alerts on liquidity shortfalls would be received immediately. All parties would know their current exact liquidity positions. The payment capital would not be locked up for days in batch processing. Receivables and payables would be aligned immediately with both bank accounts and the counterparties' bookings. The status on any payment could be controlled immediately and there would be no limit on payment archiving information, which could be retrieved online.

Low-cost efficient server technology has facilitated this development, together with the improved communication facilities and networks. Any company or industry can now afford online applications. The costs of server processor capacity follows Moore's law, and we will see the same reduction in costs per basic processing instruction as for storage capacity, ie in 5 years the costs will decrease 80–90% from current levels.

Online end-to-end transaction-driven processes are easier to program than traditional batch processes, because the total task can be broken down to small basic tasks, subprocesses, which are preformed under common control. If all tasks can be preformed successfully, the end result will be that the payer's account is debited and the payee's account is credited. Otherwise an error is detected, which hinders processing, and the cause of the error can be directly made known to the initiator, who can make a correction directly or at least knows that the transaction has been discarded and the reason for it. The customer can then directly decide on the best action in an error situation. Each payment is processed completely independently of all other payments. There is a total end-to-end control at the level of individual

transaction. The focus on one transaction at a time makes the building of applications and subprocesses less complex. However, the operating system, database managers and the rest of the technical environment can run several processes and transactions in parallel, so that total throughput can be sufficiently high. In online end-to-end processing, the sub-tasks/processes must be preformed only once, while in the old batch environment the same data have to be read, written and controlled several times during the flow of batch processing, which results in several redundant intermediary storage and processing phases.

The transformation to real-time transaction-based processing has been facilitated by the greatly improved network communications and software building tools, which will be analysed in the next sections. The most significant improvement for customers is that they are continuously informed of the state of all their payments and liquidity positions.

8.3 Impact of increased low-cost data and wireless communications

Telecommunications have seen the same kind of rapid development in the waning years of the last century and the early year of this century as have other areas of ICT. In the 1970s, when the first data communication lines were built, the public telephone network transported user data at a speed of 110 baud (bit/s). Today one can get a basic broadband home connection via a public telephone networks with a speed of 1 or 2 Mb (Megabits) per second. In the Helsinki region, the charge for such a connection is now (August 2007) about EUR 20 a month. 110 baud means a transportation capacity of about 11 characters per second, which, by rule of thumb, translates to efficient communication of about 5 characters. 2 Mb translates to about 100,000 characters per second. In order to understand how this capacity relates to payments, we can calculate, based on 60 billion cashless transactions handled in the EU15 countries, that there are on average about 17 million transactions a day (360 days a year), and if these would average 500 characters in length (clearly an over-estimation of the current average length) the transportation need would be 8.5 billion characters a day. The daily capacity of a single 2 Mb connection is about 8.6 billion characters (based on efficient rate of 100,000 characters per second). The data communication capacity needed for basic payments is so small that the whole traffic could

theoretically be channelled via one basic consumer broadband connection, and there are much faster connections for business-to-business needs. In practice there are rush hours etc requiring more capacity, but the main point with this calculation is to show that it is no longer a cost issue to transport payment information on any scale that customers would need. Compared to the capacity needed for distributing DVD material via the Internet, payments will require a very tiny share.

The drivers for increased communication capacity transmission of voice and pictures require much more bandwidth than the basic payment data. Payment data can therefore be transmitted using only marginal capacity in the networks. The costs of the data communication needs of one single payment will therefore become literally marginal, ie less than euromillicents. The point of these calculations is to show that there are no longer any practical cost or capacity restrictions on transferring any payment immediately, with any necessary data item included.

Wireless connections have boomed since the late 1980s. Mobile phones have become available to everyone. Mobile phone connections are also used increasingly for connecting remote computers. These are often personal laptops, but increasingly also remotely controlled computers for monitoring purposes etc. We can see the same development towards increased speed for wireless long-distance communications. The current generation of mobile telephone systems, 3G, provides data communication speeds of 0.2–0.3 Mb. The next generation, 3.5G, already being tested, will increase wireless speed to that of consumers' current wire-based connections, ie 1–2 Mb. The next designs, generations 3.7G and 4.0G, promise speeds ranging from 3–8 Mb and to even more than 20Mb and general availability perhaps by the mid-2010s.[46] Because the maintenance of physical lines is costly compared to wireless networks, we will see an increasing change from wire-based telephone connections to wireless mobile connections, especially in rural areas. The freedom of location also makes wireless connections more attractive. Basically, for payments, this means that e-banking connections will become mobile-based and customers can access a bank from practically any location.

Telephones provide long-distance connections. However, there are also interesting developments in short-distance connections (some centimetres to some metres), which are attractive to the payments industry. Infrared communications, Blue Tooth and RFID (Radio

[46] Lassila (2006).

Frequency Identification) are such near-field communication technologies. The use of Blue Tooth has increased in recent years, but it can mainly be used between two active computers and so requires a separate energy supply. The RFID technology was originally designed to replace bar codes as product identifiers but was expanded to identify efficiently even individual packages or bottles of produce. Instead of optical scan as for barcodes, the RFID technology uses radio frequencies, and the scanning can be done simply by having the RFID tag close to the scanning device.[47] In RFID technology, the RFID tag contains an antenna and the energy needed is provided by the reading device. However, the micro chip inside the tag is a processor that can contain data and can also control complex processes. RFID communication standards can also be used for communication between two active computers so that RFID can be used in future for communicating payment data wirelessly and contactlessly eg between mobile telephones and point-of-sales terminals, vending machines, ticketing devices, price information tags etc. Contactless payment cards based on RFID technology are already in use. The basic improvement which RFID and Blue Tooth can bring is highly automated, rapid and low-cost transmission of data between devices close to each other, which speeds up the payment process. The data content can also be expanded and the transmissions can be made more secure via encryption and improved customer/device identification.

Figure 8.1 **Ubiquitous electronic network connections digitalise all kind of payments**

[47] See for RFID details in Heinrich (2005).

The ubiquitous electronic network connections (Figure 8.1) will transfer payment information in digital format between all kinds of terminals, payment account applications, customers' payment devices etc. This will obviate the physical forms of payments and transform payments into streams of bits between different devices. For example, for a taxi payment, the payer's card or mobile phone will interact with the payment terminal of the taxi driver, which will use the network to contact the payment account for authorisation and booking. Both payer and payee will be able to electronically contact their payment accounts from any location and move information between them. It is basically the omnipresent network capability that is the big driver between new digitalised payment instruments. As the old data communication limitations have also disappeared, any relevant data can be transmitted immediately, both long-distance and short-distance, without the limitations of wiring. Payments will therefore become a wireless digital network commodity already in the near future.

8.4 Software, freeware and shareware developments

The legacy systems of the payment industry were designed using batch tools and eg the Cobol programming language. The new generation of applications are being developed using object-orientated programming and are designed for distributed transaction-driven systems. Java and C++ are the most common programming languages. The idea in this new design and programming environment is to split the tasks into small basic entities and build libraries of re-entrant code. The same basic pieces are then reused in the different applications. For example, adding days or comparing dates can be quite complex, but there are ready-made libraries for all kinds of day and time operations. These need only be imported to the proper program. The payment processing can be split into basic sub-processes, as was done on a high level when discussing costs (see Figure 5.4) A library for payment processes will probably emerge during the next years, when the data and payment methods are internationally better standardised.

In this modern programming environment, there is also a growing number of libraries, applications and complete systems called freeware or shareware. These are provided by different parties, eg academics, and can be used for free. The amount of available freeware and shareware on the Internet for basic consumer needs is astonishing. When payment interfaces become more standardised, we will

probably see the same developments in payment processing. Companies and consumers can find interesting payment software on the Internet, which will increase their interest in electronic payments. This can also reduce the costs of developing banks' payment applications. One important consideration is that such security as is needed in handling money requires more trust than in handling pictures. This will be discussed in subsequent sections in this chapter.

This development will probably result in easy-to-use customer interface software. Sending a payment can be compared to sending an email. Customers' payment accounts would look like email accounts, with incoming and outgoing messages that update the account balance. The customer can browse his payment transactions on the screen, as he now browses his emails. This standardisation of the payment interface will probably result in the emergence of a limited number of surviving 'payment browsing' software providers, as seems to be the end-result in other similar network services.

8.5 Impact of the new data description method XML

Current payment message and file structures were designed when fixed length data fields and fixed records were the norm. The payment data was just one long piece of data (characters and numbers) and the reading application needed the exact description programmed into its reading functions in order to read the data. These payment messages have emerged over the years and there is a huge number of different file/message descriptions due to legacy decisions on the national or company/bank level. Generally, each payment instrument has different message standards for incoming and outgoing messages versus interbank and customer-to-bank messages.

XML (Extensible Mark-up Language) is a new data presentation standard that is becoming the de facto standard for all types of messages between programs and also for files.[48] It has been selected as the basic data standard for SEPA payment messages, ISO 20022.[49] The basic idea in XML is that every data file or message contains both the data and the description for reading and interpreting the data, and

[48] See for example Electronic Business Use of XML: http://ebxml.xml.org.
[49] More information can be found on www.iso20022.org.

there are clear format and content rules for any data field in the message or file. XML has several benefits:

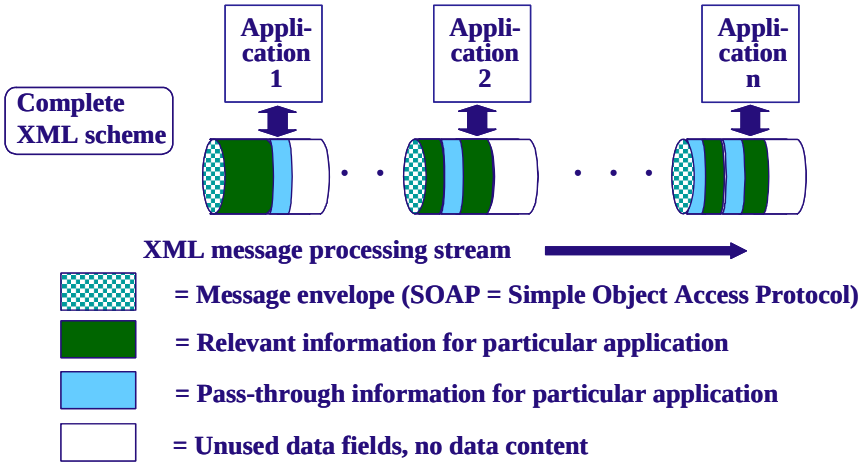
- receiving application can always check that the data to be read is essentially the correct data
- different versions of descriptions can co-exist, as the description of data follows the data (no need for coordinated changes in all systems at a given day and time)
- applications can retrieve from messages the exact information needed
- messages can use very general data content descriptions covering the needs of several applications and users, because the 'unnecessary' data for one application are simply passed through to the next application
- data definitions and attributes can be used directly when programming screen views or printable lists using so-called style sheets
- messages can vary freely in size no need for fixed-length records
- new data fields can easily be included in descriptions, and only those processes using them need to be developed and/or updated
- no need to convert message and record formats, as all new applications can directly read the standardised descriptions (if conversions are required these can be automated using mapping and remapping software)
- file and message length will increase due to the new description information needs, while the benefits due to improved data management and change management are much greater especially as storage restrictions are eliminated.

The XML standard includes a data field naming convention (tag) and data field characteristic descriptions (attributes). Each data field is given a clear text tag, eg 'DueDate' and attributes, that can be used for checking data content and for presentation purposes, eg data type date, presentation format, title etc. The data fields are arranged in descriptive XML schemas, which contain the definitions of all available data fields. The technical data schemas are based on data dictionaries, that describe in detail the content of each data field. The presentation descriptions are contained in style sheets.

XML supports clear definitions and naming of data fields. The attributes of the schemes facilitate automatic verification of data content. The descriptions in the schemes can be directly used as data descriptions in software developments. Tagging supports flexible data content according to needs, ie only fields with data content need to be

included. Tagging also supports flexible expansion of data content, even with user group-specific data fields. The file lengths will increase with the overhead in the form of Tags, but since data storage and transmission costs are declining rapidly the benefits of a more flexible and adaptable data description language is much larger.

Figure 8.2 **XML changes the communication pattern through data consolidation**



The XML tags and associated scheme will create a new type of processing convention (Figure 8.2) in which all data connected to the process will be transferred between the different applications. Previously data transfer limitations meant that specific messages were needed for the different processing legs. With XML and without data transfer or storage limitations, the data can be consolidated into a general message containing the data necessary somewhere in the process. From this comprehensive message, the different applications will extract the interesting data based on XML tags. The different applications can pass to each other the complete set of data belonging to any type of payment.

XML will thereby facilitate creation of a common Financial Transfer Message (FTM) based on a common data dictionary, which helps to clean up the current mess of different messages and message standards. All payments – credit transfers, direct debits or card payments – include the same basic data elements. There could be one common description for all payment messages. The same message could also be used for all processing phases (initiation, interbank transfer, receiver notification etc) by including a ‘phase indicator’ that

indicates the current processing phase of the transaction. As the transaction moves through the process flow, data can be added or changed in the message at any phase, but the same FTM XML description is used throughout the process. The FTM description should also be enlarged to include data important for end-customer integration, such as e-invoicng data. The flexibility of XML entails good possibilities for including data for efficient customer integration without affecting the bank systems, which need only pass on the relevant information. XML will greatly simplify the data management tasks of payments while presenting completely new possibilities.

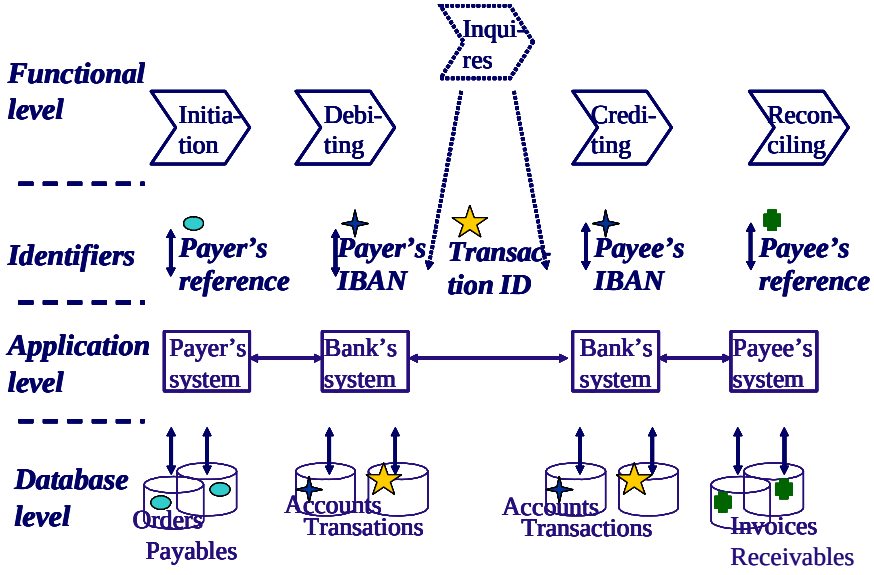
8.6 General account addressing and transaction reference solutions

In ICT processing and especially network-based processing, addresses are essential. Every account, transaction, organisational entity, processing site etc needs a clear and unique address so that it can be recognised and reached over the common network. The increased data storage capacity enables one to address individual items and products. For example, RFID tags could be used to identify individual bottles of beverages. Most new addressing systems are designed for international usage, like RFID codes, email-addresses, flight destinations, telephone numbers etc.

Because payments have been very local transactions, there are no international addressing standards widely used for payments. BIC (Bank Identification Code) is used only for international payments. IBAN (International Bank Account Number) is just starting to be used in Europe and some other countries. In order to improve payment efficiency, the basic issue of addressing coding needs to be addressed. We need standards and codes for customer, account, transaction, payer reference information and payee reference information identification (see Figure 8.3). Addresses and identifiers are needed to connect the functional, application and database levels. A universal account number structure is needed to find the correct payer and payee accounts. Each transaction needs a unique transaction ID so that it can at any time be found from the different transactions databases. The payers and payees need to be able to connect the payments with their order, payables, receivables and invoice databases. Every customer and bank also needs an identifier. Without agreeing on these basic addresses, the payment processing cannot reach a high automation level. Countries with high automation levels have created their own

national standards so there is a need for harmonisation that will hopefully be part of an effort to achieve a complete and efficient addressing system from the start.

Figure 8.3 **Required basic addresses and identifiers for automated processing**



The new efficient database technology and improved capacity of processors have provided efficient solutions for cross-reference tables. These can be employed efficiently in two ways for addressing systems:

– technical addresses can be separated from logical addresses
– logical addresses can be made portable.

Technical addresses are often complex numeric series and difficult to remember or key in. It is easier in daily use to have understandable and meaningful addresses. For example, behind every Internet www address is a server IP address, which is looked up for every surfing request from a cross-reference table. All mobile telephone numbers and most wire numbers used by customers are now logical numbers, behind which direct physical numbers can be found. Logical addresses help to hide messy technical addresses that have been designed with

technical needs in mind. Any change to a technical address can be made without changing the logical address.

Logical addresses can be made portable. A fixed logical address connects the address to a given service provider, and changing the service provider would require changing the address. If the address is portable, the logical address can be moved to point towards the technical address of another service provider. Mobile telephone numbers in EU were required to become portable some years ago. Customers in Europe can therefore change mobile telephone providers without changing their telephone number.

The need for portable account numbers will grow over the years as the use of account-based payments increases. Today the need for portable accounts numbers is mainly with larger companies receiving huge volumes of payments. However, in future, when direct debits, e-invoicing and consumer-to-consumer payments are more widely used, the consumer account address will be spread to a large number of systems and applications. All these would need to be updated, if account numbers were not portable. The customer demand for portability would become stronger and banks would also benefit from portability, as there would be much fewer errors in the payment system due to closed down accounts. It may also be that competition authorities or politicians will require account portability just as portable mobile telephone numbers are required, because they support both competition and customer mobility. Cross-reference tables and portability can be introduced at low cost in modern network-based systems.

Improving the efficiency of payment processing will require a common global standardised addressing convention for both the accounts involved and each payment transaction. Absent such unique reference numbers, payments cannot be properly digitalised and meet the straight-through-processing objectives. Account number portability would be the next step in the development process, which could be taken at same time as the basic standardisation is accomplished.

8.7 Developments of mobile hand-sets and mobile services

Regarding the development of mobile hand-sets it can only be repeated that the development of this business line since its start in 1980s have been enormous. The number of mobile hand-sets in use is

today more than 3 billion.[50] In 2007 alone almost 1 billion hand-sets were sold. Today about half of the world's population has a mobile phone and in the EU mobile phone subscriptions exceeded the number of inhabitants. There is no other device that has been brought to the use of such a large population in so short a time.

The first mobile telephones were used only for normal calls. The SMS (Short Message Service) text message service started the boom of new types of mobile services. Today more than 2.5 trillion text messages are sent per year.[51] Games, mp3 and radio-services have been included especially for younger users. Many mobile telephone users use their phone as a portable clock. In 2007 camera phones hold 85% of the mobile phone market.[52] GPSS navigation services are included in the telephone together with email and dictionary services. The popularity of Smartphones, communicators and PDAs, which now provide almost PC-level computing service, including word processing, spread sheets and presentation facilities, has increased rapidly. The computing power and storage capacity of hand-sets are expanding rapidly. The newest feature is wireless TV services. Everything points towards our mobile phone becoming our personal computer, always within our reach, with sufficient power, applications and connectivity to satisfy all our data processing and retrieval needs. The mobile phone will also become our Internet browsing device.

As the mobile phone becomes our Internet browsing device, it will also become our e-banking device. The mobile phone has a number of features that are interesting in terms of payment services:

- users carry the phones with them all the time
- GSM mobile phones employ a secure chip card (SIM card) for customer identification and encryption
- hand-sets are equipped with keyboard and screen for payment acceptance, initiation etc
- sufficient computing and storage capacity for payments
- new versions equipped with RFID and Blue Tooth connectivity for near distance communication
- long-distance communication can be used for e-banking.

[50] See www.wikipedia.com, which refers to Reuters news of 29 November 2008. This is inline with information from other market analyst resources like the Gartner group, Ovum etc.

[51] This estimation is made based on different market analyse reports found in Internet with a margin of about +/- 0.5 trillion messages.

[52] See www.wikipedia.com.

The mobile phone has all the features needed to make it our future payment instrument and device. However, there are some prerequisites:

– hand-set manufactures must provide a high security level so that virus and Trojan horses cannot steal money (see Section 8.8 for details)
– hand-set manufacturers, mobile network operators and banks agree on a common model for customer identification
– mobile network operators need to provide low-cost communications for payment messages
– message and interface standards are created for necessary messages between point-of-sale devices and mobile phones, between mobile phones and banks' payment applications and customer devices.

The use of mobile phones as a payment instrument or payment initiation device highlights well the problem of increased technical complexity. In order to get mobile payments to work technically, numerous applications must be created or modified to support the lengthy chain of sub-processes needed to complete a payment task. Banks, mobile operators, handset producers, merchants, point-of-sale terminal providers and consumers need to update their equipment and applications to support mobile payments. A possible scenario for mobile payments is presented from the service point of view in Chapter 9.

8.8 General identification and security solutions

Experiences from the physical world of money tell us that unprotected money will be stolen or counterfeited. The same is true for electronic account-based money; it must be stored in an 'electronic safe' in order to be secure. The Internet is a very open network and therefore it is also open to criminal activities. Customer PCs which are connected to Internet are at risk of electronic attack. However, using e-banking services would not be possible without external connections, so the challenge is to create a secure e-banking and e-payment environment.

Sending a clear-text message via Internet has been compared to sending a postcard in the mail. Everybody handling the postcard can read the message it contains and even alter or even destroy it. Sending

monetary messages requires customer identification, encryption using a secure encryption method and end-to-end reception/acceptance control. The sending customer needs to be identified remotely and electronically using some identifiers in order to ensure that the message is coming from the correct source.

Currently remote identification has mainly relied on different kinds of password schemes. This has lead to the common 'phising' attacks, when criminals try to get customers to provide their passwords and/or the content of their password listings of those banks using physical passwords listings. More secure identification solutions are under development based on hardware devices and biometric characteristics. The electronic identification and encryption issues are related, as the encryption keys must be personal.

Good encryption hinders manipulation of payment message during the telecommunication transfers. Messages are encrypted using calculation algorithms and encryption keys. The longer the key, the more difficult it is to detect the message content by enumeration of the possible keys. The most widely used encryption algorithms today are DES (Data Encryption Standard) or its more robust version, Triple DES, and PKI (Public Key Infrastructure). DES is based on symmetric keys, ie the sender and receiver use the same key for encryption and decryption. The keys in PKI solutions are asymmetric, ie the sender encrypts with the public key of the receiver and his own private key while the receiver decrypts with his private key and the sender's public key. These algorithms are often used in conjunction, so that the (triple) DES algorithm is used for massive encryption and the PKI is used for encryption of DES keys, customer IDs etc, because the DES algorithm requires less computing resources.[53]

However, the customers' PCs are completely open devices. They contain programs from several sources. Programs can be downloaded from the Internet So-called Java applets can be sent as a part of an accessed web-page or a received email to the user PC and can then start to perform different types of operations. Typical viruses have been destroying file content or causing other kinds of interruptions in use of the PC. Some of these initiate junk mailings from the unprotected user PC. As PC- or mobile-based money transfers increase, criminals become more interested in stealing the money. Well-designed Trojan Horse viruses could be distributed in various ways to the user PCs to observe and analyse the user's payment behaviour and passwords. The PC is an open environment, so that

[53] For details on encryption algorithms see Schneier (1996).

criminals could construct Trojan Horses for record user identification numbers, passwords etc. They can also take control of the key board and screen in such away, the user would see fake information on the screen and the money transfers would be going to completely other accounts than was the purpose.

Customers' PCs and server sites are in most cases protected by security applications called firewalls.[54] The purpose of these is to detect and foil intrusion attempts. However, the problem is to distinguish dangerous communication traffic from normal and necessary traffic. Access rights can be limited for outsiders and also for inside applications. Experience shows that there often remain loop holes. Firewalls are updated continuously with 'fingerprints' of different kinds of 'malware' like Trojan Horses. However, these updates can only be done after that the first new type of malware incident has been detected. The 'black list' register of firewalls is therefore always somewhat outdated. Many customers are not attentive enough to install a proper firewall and maintain it in a proper way. This is one of the basic problems due to the openness of Internet. It may be therefore be necessary in future to limit the openness of Internet, create security cleared cooperation groups etc to reduce the risks of malwares. (This issue is also discussed under data privacy issues in Chapter 11).

With a reliable payment device, the customer can trust the information on the screen and trust that the commands and input data he enters are not tampered with. This requires a tamper-proof or at least tamper-resistant device including screen and keyboard. It would therefore be important that future mobile hand sets be designed so that a secure chip can hold the customer identification and encryption keys and perform encryption and decryption, and the screen and keyboard must be part of the tamper resistant design. This is inline with the current mobile telephone security and signature standards (see for example ETSI 102 204, ETSI 102 206 and ETSI 102 207). If the design of mobile hand-sets is made as open as PCs, the users will need a special payment device for controlling payment flows in a secure way.

Currently, there is a variety of conventions for customer identification. Payments are initiated using eg ID cards, driving licenses, bank cards, userIDs and passwords. These are used in parallel and there is no clearly dominate convention. There are basically three ways to identify a customer:

[54] See for example www.wikipedia.com, www.fsecure.com and www.symantec.com.

1) he uses an identification hardware device (eg a chip card)
2) he knows a secret (eg the PIN code)
3) he has individual features that match the feature profile (eg a fingerprint).

The more methods that are used at the same time, the more secure the identification will be. However, user inconvenience also increases, as well as costs, as the number of employed security features increases. Getting money out from an ATM by simply inserting a card is much less secure than if a PIN is required at the same time. If some biological identification would be added, the security would increase, since it would be more difficult to use a stolen card even if the PIN is known by the criminals. There are several biological identification methods under development, eg fingerprint scanning, blood vein pattern scanning, retina scanning, lip movements and voice patterns. None of these have yet reached mass implementation.

There is currently no international customer identification coding only different kinds of national or organisation-level systems for customer identification. The e-banking and e-payment environment would benefit from a standardised global customer identification system. All the different cards that we carry around are simply customer identification devices. One common one would be sufficient; all the various service agreements could be based on it. One common system would also mean that customer e-identification could be standardised. The same method would be used for all service providers, government agencies etc. However, there is of course a concentration of risk if all systems and service providers are dependent on the one and only method. This should be probably be addressed in the design of the system, so that it is sufficiently robust and free of weak links. It would already be a great improvement if interoperable standards would be designed even if there were still national systems and databases. However, reaching agreement on a common standard seems to be far away, and putting ‘all eggs in the same basket’ will create consolidation risks.

Account-based transactions must leave an audit-trail, which is an important security feature in that it increases greatly criminals’ risk of being caught and enables tracing and freezing funds, that have been fraudulently transferred. Profiling customer payment habits and alarms for deviant customer behaviour is an important way to reduce the risk of fraudulent transactions. Audit trails and customer privacy are diverging objectives, an issue that is discussed in more depth in Chapter 11.

A security solution is never complete. There is a continuous race against the criminals. When new security measures and barriers are implemented, criminals start their search for weaknesses and loopholes. There is also a cost aspect, as the more the security features introduced, the higher the production costs. Therefore for any given time period the service providers need to strike a balance between criminality risks and security costs. Payment security levels have continually risen, but this has not been fully reflected in production costs, as the costs of ICT security often decreases with general cost reductions in the industry. ICT security requires increased focus and efforts in order to standardise the solutions and provide also physically safe devices for payment data at customer sites.

Increasing use of ICT leads to increased dependency on highly integrated electronic solutions. These then become dependent on each other, and malfunction in one component can result in larger outages. It is already today difficult to run supermarkets during electricity outages and most supermarkets close when the point-of-sale equipment is down. It will be important to build good back-up systems for all important payment systems, which include both hardware and software back-ups. Payment systems are so important to the society that we cannot be in a position where a single point of failure would close down all major payment instruments and methods for several hours.

All the other payment processes can be digitalised using currently available standard IC technology. However, the electronic security solutions will require new developments for which there are no proper paper-based conventions. Solving the security issues will require good international cooperation. If not solved in an efficient way, the growth of e-commerce and e-payments will be delayed, as no-one will be interested in using payment methods that are too risky.

8.9 Summary of technology developments

Recent ICT development has been dramatic, and the changes seem continue at an increasing speed. Capacity and cost restrictions, which have previously affected system designs, have almost completely disappeared. This enables to re-engineer the systems and integrate customer systems for synergy benefits. However, the current systems carry a large legacy burden, and the changes need to be well-coordinated in order to save costs. Banks are facing the same timing issue as a modern electronic equipment consumer. When is the right

time to re-invest in modern equipment and applications? The problem is much larger at the industry level. However, the potential benefits of change have become so huge, that the efficient reinvesting point seems to be very near.

As a condensed summary it can be stated that we are heading towards a situation where payments can:

– carry any necessary enclosed information
– be processed instantly in real-time
– be sent from anywhere using wireless connections
– be initiated via mobile customer devices in a very standardised, electronic and automated way
– be processed securely at very low costs.

Customer identification and payment security issues will need global attention in order to create robust standards. There is a risk that poor security solutions will result in increasing e-payment fraud, which would most probably delay developments. The increasing dependence of electronic payment systems will require attention to avoid single point of failure situations, which could bring all major payment instruments down for longer periods.

9 Potential payment service developments

Payment services have in the past developed as an evolutionary process. Banks have been the main service providers and new features and services have been introduced step-by-step without revolutionary changes. All recent proposals of revolutionary changes and hype ideas have been failing in some ways. For example e-money and e-cash services based on chip-cards have not been captured the market. Different kind of Internet-money, cyber-cash etc have not attracted the necessary critical mass, with the exception of PayPal.[55] However, the situation might change at some point, when customer readiness for new instruments has increased sufficiently and the new services can provide sufficiently sizeable benefits as compared to traditional instruments. However, it also seems that any new technological development will have a higher initial barrier to overcome than was the case before. Nowadays, a new development usually has to be implemented in more old systems than before. For example, introducing e-invoicing will require changes to almost all bank and customer payment systems.

There is a continuous stream of new payment ideas, innovations and trials. Some of the new potential serviced developments are described in more detail in this chapter:

- common customer standards and a common financial transfer message
- e-invoicing and e-orders
- e-archives for payments
- payment and DVP guarantees
- e-identification based on payment instruments
- mobile payments
- electronic substitute for cash.

These have been proposed by customers and bankers in our interviews and questionnaires. They are topical today and seem to have a good potential to become largely accepted. These are supported by ICT developments, which provide new possibilities especially for customer

[55] According to PayPal's own information at www.paypal.com, they had more than 150 million payment accounts in 190 markets and 17 currencies at end-2007.

interfaces and integration between banks and customers. Customer-to-customer integration supported by bank services seems to be one of the main elements for increased efficiency.

9.1 The push for common customer standards

Compared to other industries, customer payment standards are very nation- and often bank-specific. Most other network industries have seen the benefits of common customer standards. Common e-picture standards supported the rapid growth in the digital camera market. CD and DVD markets would not exist without common standards. The immense growth of the mobile telephone market would not have been possible without a common GSM standard. Email, thanks to its common standard, has become one of the main communication vehicles in the e-world. Global customer payment standards would increase customer interface efficiency and integration.

The same factors causing in the slow pace of development in the payment industry have also slowed the standardisation efforts. Examples are the status as a complementary product with given volumes based on overall economic activity, hidden prices, high access barriers to new entrants, monopoly network structures and legacy investments.

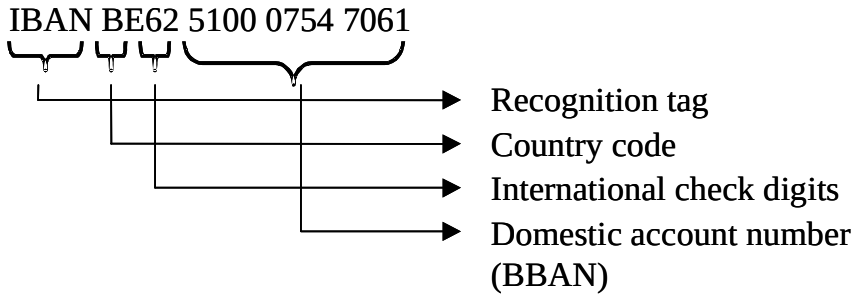
However, the push for common customer standards is gaining momentum as more and more customers comprehend the benefits of standardisation. New tools such as XML data description conventions also support the move to common and versatile new standards. All payments contain essentially the same information and functions. A common set of data standards could be developed for all payment instruments. The main development areas of customer payment standards are:

– customer account address
– message data content and transported remittance information
– common message structure and dialogues
– user interfaces
– customer identification and data encryption services.

A common account number standard is needed to enable customers to send payments to each other. A global account address standard is as important for efficient processing of global payments as global addressing standards have been for international phone calls and

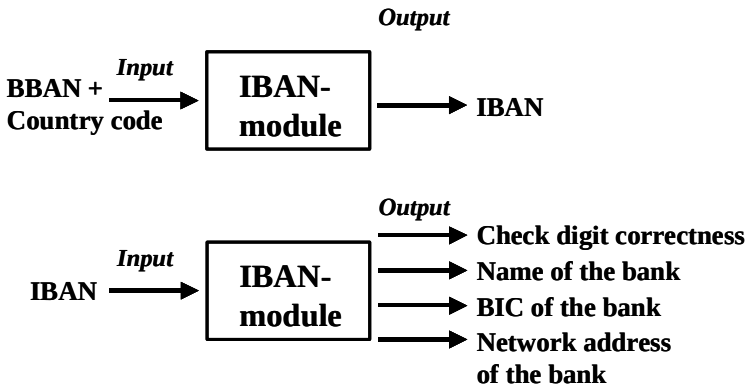
email. Account number standards are available in most national payment systems, but there is no generally implemented international standard. The IBAN (International Bank Account Number) standard (ISO 13616), developed on the basis of domestic account numbers (BBANs, Basic Bank Account Number), resembles the country prefix used in telephone numbers (Figure 9.1). Its implementation is progressing in the SEPA region and in some other countries and has the potential to become the general account address standard. In the computerised e-world, the 'visual' beauty of an address code is of little importance; it is more important that the coding is generally accepted and is unique and technically functioning. The industry needs to select a common addressing standard.

Figure 9.1 **General structure of IBAN standard**



Because interoperable account numbers are so widely used at the national level, there is a need for interim conversions from national account numbers to IBAN. Most national account number systems have a clear structure that supports direct and automatic conversion to the IBAN format, given that the country information is available. This enables us to build automatic modules for account number conversions (Figure 9.2). The number of available conversion modules is increasing steadily. These will help both banks and customers in the changeover phase by reducing the manual work of changing account number standards. Especially large companies with large payables and invoicing files would benefit from account number conversion support. It seems that increasing numbers of national banking communities in the SEPA region are ready to provide these kinds of conversion services for their customers. Banks will also need IBAN modules in the opposite direction in order to use IBAN to identify the bank in question and its details, such as its bank identification code (BIC), its network address etc.

Figure 9.2 **Basic idea of IBAN conversion modules**



The card number standard is an international standard (ISO 7812) and the payments card schemes apply, almost without exception, this numbering standard. Card numbers could also be used as account addresses, but these have been designed for identifying individual cards, so that the relationship is not necessary one-to-one for accounts. Several cards can be linked to the same account and one card could be linked to several different kinds of accounts, eg a customer's debit account and credit account. There is thus a need for a cross-reference table between card numbers and linked account numbers.

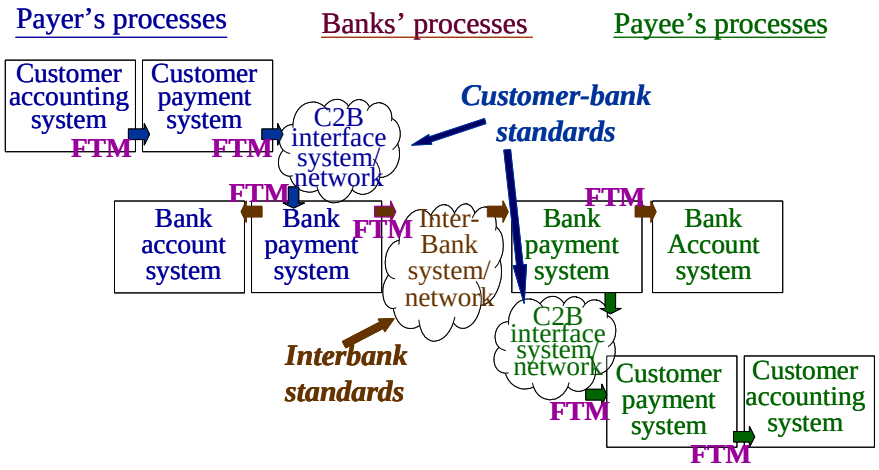
The SWIFT organisation has developed message standards for international payment messages, especially for interbank transfers. Most national payment communities also have separate domestic interbank message standards. These have generally been developed separately for each payment instrument (credit transfers, salary payments, direct debits etc). Customer-to-bank message standards are generally more bank-specific, although the banking industries of several countries have agreed on common customer payment message standards. Although no international customer-to-bank standards have yet been implemented, the work on ISO 20022 XML standards has this as an objective.[56]

It would be important to create a flexible and general payment standard applicable to all types of payments. All payments contain the same basic data fields, which should be standardised into a basic message format (eg sending bank, receiving bank, intermediaries, sending customer, receiving customer, amount, remittance

[56] For more information, see eg www.iso20022.org.

information and basic transaction details). When all data fields are assigned common XML tags, all of the payment messages will have very similar content. This enables one to design a common financial transfer message (FTM), for use throughout the payment (and invoicing/ordering) process, because the data contents will be the same (see Figure 9.3).

Figure 9.3 **Complete end-to-end STP using the same financial transfer message throughout**

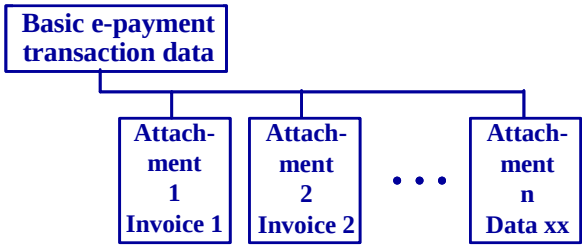


Each application in the processing chain can use the same basic XML scheme and retrieve the data fields necessary for processing at that point. The data content (message) is then passed on to the next processing phase with all previous data included. The message will thus contain the whole processing history. Instead of a different message for each transfer leg-, the common message will contain instructions to the receiving application for handling and processing the incoming message.

Additional information can then be added in a modular manner in separate enclosures, based on their internal standards (Figure 9.4). This construction resembles the efficient and modular structure of emails. The basic email has the important address information, transaction management information (time, data, identifiers etc) plus some basic message text. Any large supplemented information can be found in separate enclosures. It can also be compared to the old cheque payment convention of the paper world, where cheque and accompanying invoice were placed in the same envelope, to enable

the receiver to identify the invoice that has been paid. This kind of structure would support future developments, where the message content of attachments could be developed without affecting the basic payment transportation systems and customers could flexibly form enclosure message standards so as to include the information that is essential to them.

Figure 9.4 **A modular and flexible common payment message standard is needed**



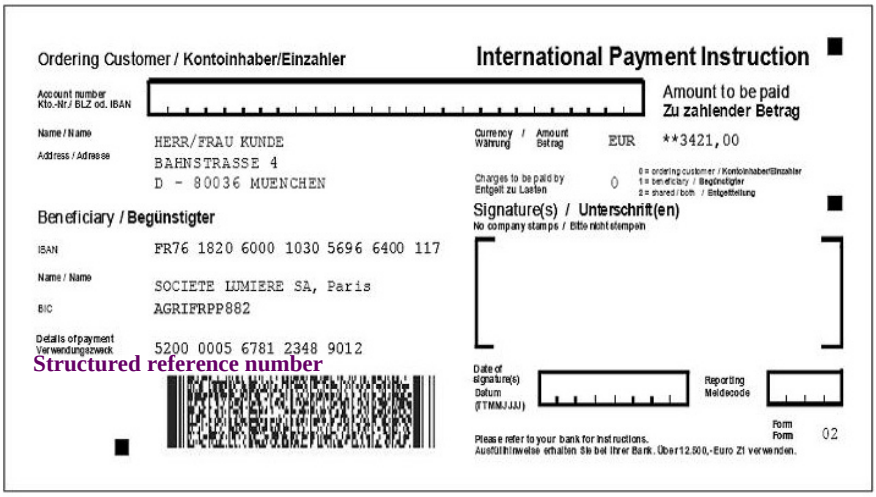
It is already the case that the processing of a payment transaction is usually a dialogue between different ICT applications. This will be true even more so in the future because of process-to-process integration. This kind of dialogue has been described in Figure 5.4, where the sub-processes of payments were set out. The payer or payee initiates a payment, which initiates a series of sub-processes that communicate with other processes in a given dialogue. Each outward communication message receives a confirmation and then triggers another process until the transaction is completed. In order for the sub-processes to be interoperable, this message dialogue needs to be standardised, so that each sub-process has defined tasks and can rely on performance of these tasks in the same way in all banks, clearing houses and other processors within the transaction flow. It is essential for the customers that each bank implements the same dialogue, so that customer applications can be developed on a common template.

Customers also require common technical interface standards. In the e-world this means that electronic contacts with different banks can be founded on the same network standards and protocols. The general ICT developments have been supportive in this regard. The available communications protocols are applicable to different kinds of business-to-business and business-to-consumer communication needs and hence also suitable for payment communications. However, these interfaces have been developed over time and so include a number of non-interoperable generations and techniques. The banking

industry needs to adopt a common policy that supports interfaces. For future developments, one of the most important issues is to find an general architecture for process-to-process communication; the standards of SOA (service-oriented architecture) and SOAP (service object access protocol) point to a promising course of development.

Although in the future most communication will be electronic, customers will need some kind of screen views or images as personal interfaces. Most customers will in near future use almost solely e-banking services, but for many years yet there will be paper-based payment instructions at the national level. Cheques have, over several hundreds of years of use, developed a visual de-facto standard, which everyone can recognize at sight. Credit transfer (giro) forms have developed more in accord with national preferences and thus vary considerably. For SEPA and other purposes, the credit transfer instruction form needs to be better standardised; it could then serve also as the basis for a common layout of screen shots and images. This is an essential support for cross-border usage of credit transfer instructions. The ECBS (European Committee of Banking Standards), which has merged with EPC, has developed a proposal for the international payment instruction form (IPI) that contains the main items in a simple credit transfer (Figure 9.5). Another possibility would be to take the current de facto email standard as starting point and add the account number information and other payment-specific data.

Figure 9.5 **Proposed international payment instruction form (IPI)**[57]



Source: ECBS/EPC.

All payment instructions need to be authorised by the customers and processed in such a way that nothing gets altered from the original instruction during processing or transfer of the payment. This requires good customer identification systems and transaction protection. This is a challenge for standardisation in the e-world. Customers need to be identified in a secure way remotely via telecommunication and the instructions need to be encrypted in a secure way so that they cannot be intercepted and changed in a fraudulent way. Customers find it important that all banks would use the same standardised identification and encryption methods. Bank-specific solutions would increase costs and inconvenience customers if different solutions have to be used in parallel when banking with several banks. Parallel solutions would also reduce software companies' possibilities and interest in building common payment system interfaces for customers. This is a technical issue that was discussed in Chapter 8. However, it has major business implications because efficient and secure straight-through-processing requires efficient and automated identification and encryption services.

In designing future payment standards, it is important to find flexible, future-oriented and truly interoperable solutions. There are

[57] For details, see www.ecbs.org.

many examples in the history of the strong negative lock-in effects of non-interoperable standards, eg railway track widths, right or left-side road traffic, telephone standards etc.

9.2 E-invoicing and e-orders

Payments settle economic transactions, customer-to-customer orders confirm the intended transactions, and the invoices confirm the payment details. Most of the details in an order and associated invoice contain the same information. In normal shop-purchases, customers get a receipt instead of a complete invoice, but the receipt is essentially a simplified invoice indicating what has been bought and how the payment has been made. The current payment data we see today on bank account statements are again extracts from invoice and receipt information, because of the previous data constraints of the ICT systems of the 1970s and 1980s, when many of the current payment messages were first created. However, these constraints have disappeared, and full electronic invoice information can now be included in payment messages, thus generating synergies. Combining these information sets has already been accomplished in the paper processing environment, eg in the convention of attaching invoice to cheque. Now, when almost all corporate customers are using ICT systems for payments/invoicing and the number of e-banked consumers is growing fast, the payment and invoicing conventions can be redesigned for increased efficiency and synergies simply by increasing the information attached to payments.

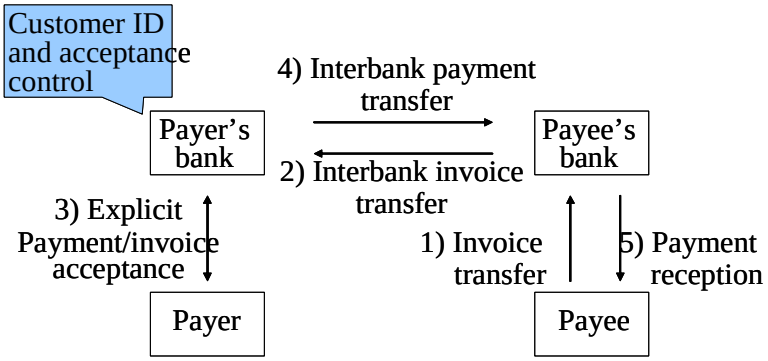
The greatest benefits would accrue if every type of payment had invoice and receipt data attached. Attaching electronic receipt data to card purchases would mean that the customer would receive full electronic details on any purchase, including eg guarantee data, and would not need a paper receipt. Attaching invoice data to direct debits would eliminate the need for a special direct debit paper notification. For credit transfers, the e-invoice would carry all payment details plus invoice details, so that the payer could pay a bill with a simple click and would not need to input payment details from paper invoice or giro form.

The e-invoices can be routed via different kinds of invoice hotels to the payer, but the banks' network is well placed to connect all payers and payees, route the messages based on account number addresses and ensure payer identity and secure transfer via a trusted network. This would almost totally eliminate the possibility of fake

invoices. The processing of card payments and direct debits would remain the same; only the invoice data would be attached to the messages.

The basic process flow of a bank provided e-invoice process[58] is displayed in Figure 9.6. It largely resembles a direct debit collection process, except that each e-invoice is generally explicitly accepted by the payer. However, banks could also provide automated acceptance services to customers, by which e-invoices received from a given payer and within predefined limits are accepted by the bank system automatically on behalf of the payer.

Figure 9.6 **Basic e-invoice process flow**



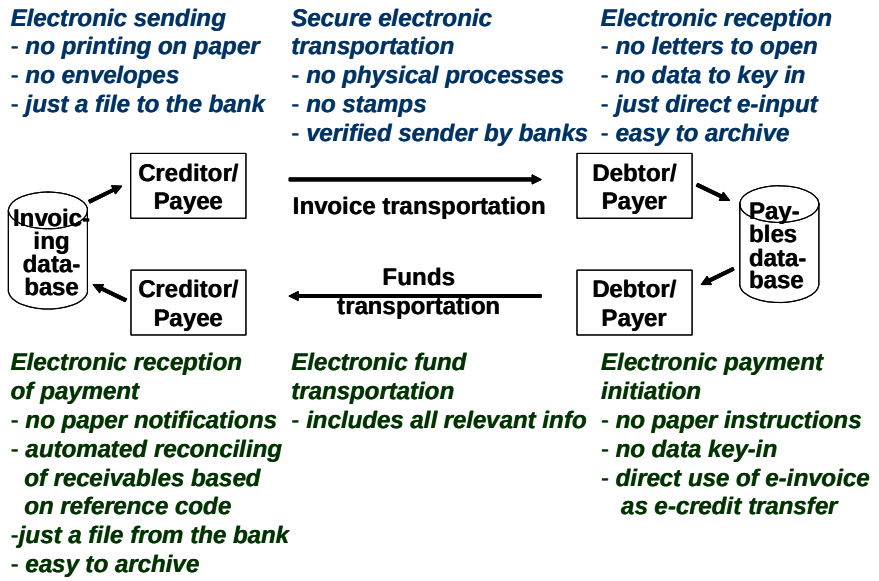
The same approach would be an efficient one also for e-orders, especially when the payee demands payment at the point of order, eg in e-commerce. The ordering customer (payer) completes an order and attaches it to the payment, and the payee receives the order as an enclosure with the payment. This would guarantee payment for immediate-delivery e-goods such as downloadable PC programs or DVD films.

Nearly all companies , barring some very small ones – now have ICT-based invoicing, receivables and payables systems. These are often linked to companies' workflow process systems, ie ERPs or Enterprise Resource Planning systems. Implementing e-invoices means that the whole workflow process managed by an ERP system can be automated (see Figure 9.7). Finnish industry estimates put

[58] For further information on the Finnish e-invoice service, see www.e-lasku.info.

savings in the range of 10–30 euros per electronic invoice compared to paper processing.[59]

Figure 9.7 **E-invoice automation benefits from corporate-to-corporate integration**



Standardisation of e-invoices is essential for achieving this level of integration between companies' systems and banking systems. There are currently several proposals on the table, and national standards have been created in several countries.[60] It would be important to create an ISO level standard that would be implemented globally. This work has commenced, and it would be to everyone's benefit if agreement could be quickly reached on a common e-invoicing standard.

Within the EU community an informal e-invoicing group has delivered its final report,[61] which proposes the establishment of a steering group for EEI (European Electronic Invoice) introduction. This informal group finds it crucial to promote e-invoicing due to its very high cost saving impact. The group has identified the lack of standards, legal uncertainties, VAT rules, and trust and confidence

[59] For details, see www.finvoice.fi.
[60] See for example EBA/Innopay (2008).
[61] European Commission (2007b).

issues as the foremost e-invoicing barriers. The main task of the proposed steering group would be to remove or at least lower these barriers.

Invoices and receipts play a key role in taxation and especially VAT reporting. Paper invoices have been quite easy to fake and quite labour consuming to control by tax authorities. Electronic invoices processed via banks will leave an audit trail, and the payee and payer information is reliable. When invoice becomes electronic, tax authorities will also be much better equipped to ensure that invoices are reported in a coherent way, at both sending and receiving end, via completely automated comparisons of VAT reporting.

As described in Chapter 7, there is great user interest in e-invoicing. The business case for e-invoicing is very good, as it produces direct benefits to customers. The informal group for EEI estimates yearly savings in the EU region of about 250 billion euros, based on calculations by the European Association for Corporate Treasurers. Estimations made by consultants for France alone reach savings of 40 billion euros per year, and the Danish government has estimated that fully implemented e-invoicing would save Denmark administrative costs in the range of 100–134 million euros a year.[62] Based on per-invoice savings of 10–30 euros and total volume of at least 30–50 billion invoices per year in the EU, savings of more than 100 billion euros per year could be attained already at a fairly low penetration level.

Although, e-invoicing began as a business-to-business service, there is also a good business case for business-to-consumer e-invoicing. This is clearly shown by developments in Norway, which has been a forerunner in this area.[63] When the use of e-banking increases, private customers also want to have an automatic and convenient way to receive invoices and convert them to payments. Corporate customers are also interested in promoting consumer e-invoicing, as it also reduces costs of the invoicing process at their end. Moreover, e-invoicing is the basis for e-archiving, which is of interest to consumers (for details, see next section).

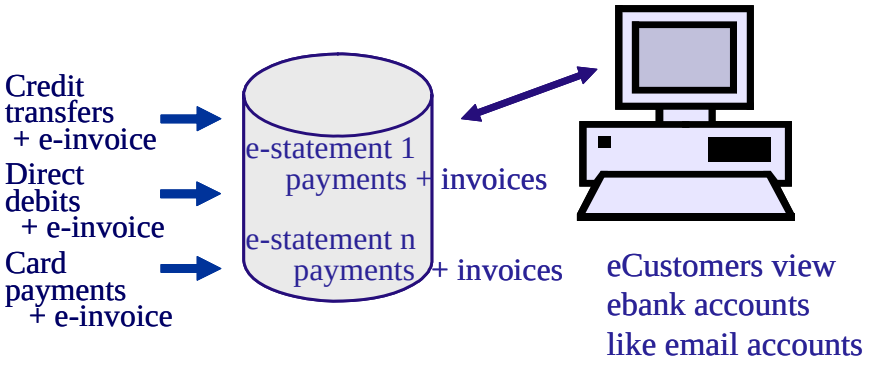
The implementation of e-invoicing has got off to a good start in several countries, and interest in it continues to grow. The benefits are so immediate that changeover from paper to electronic format will probably be quite rapid, and e-invoicing will become a commonplace business mode.

[62] European Commission (2007b).
[63] For details, see www.efaktura.no and www.bbs.no.

9.3 E-archives for payments

E-bank customers view their bank accounts mainly using PCs as terminals. To them. a bank account looks very much like an email account. The screen shows their sent and received payments, the amounts and the total balance of the account. An e-archive of customer invoices is created when the e-invoicing data is added to the payments and the storage time for payment information is increased (Figure 9.8).

Figure 9.8 **Emerging e-archive of e-invoices**



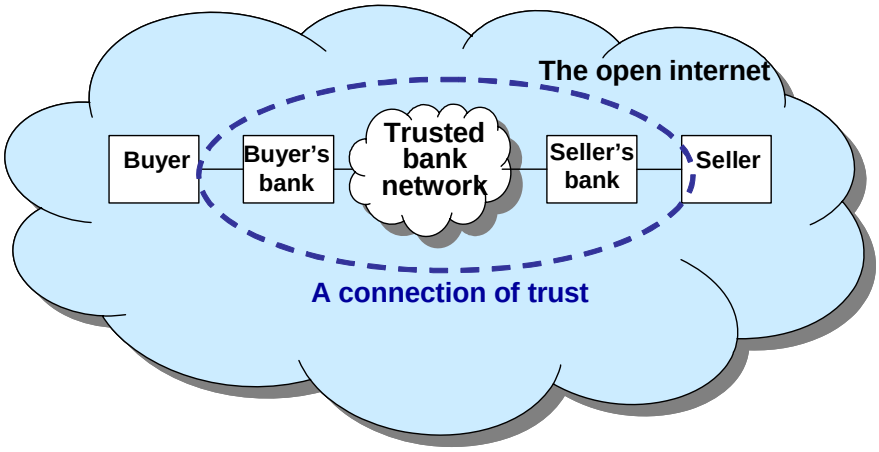
Customers can then browse for specific invoices in the same way as for emails from the email archive. All the tedious work of archiving paper invoices and receipts disappears. When eg the tax authorities want verifications, these can be sent electronically with a few clicks.

There is great interest among private customers in e-archiving services, as Figure 7.10 show. Entrepreneurs and small businesses would probably also find e-archiving combined with e-invoicing a very attractive service. Finnish banks provide a service for this customer group by which they can create and send e-invoices just by going to the e-invoicing web-page in their e-banking environment and filling in a formatted e-invoicing screen. The ready-made e-invoice is sent to the payer, and the invoice is stored in the payee's e-archive. When the payment is made, it is automatically reconciled for the payee. This service notably simplifies the invoicing tasks of small companies.

9.4 Payment and DVP guarantees

Letters of credit are used with exports to unknown partners. Credit card companies often provide a payback guarantee to card holders in case the merchant does not provide good delivery. Some card and cheque schemes provide payment guarantees to merchants. In e- and m-commerce, customers are generally not known to each other, so that a trusted third party can raise confidence and reduce risks for both parties. The buyer wants to ensure delivery and the seller wants to ensure payment. Especially for e-services, banks could provide delivery-versus-payment (DVP) guarantees by controlling for proper delivery in both directions. The e/m-commerce environment, from this perspective, resembles exports to unknown partners in foreign countries, because the e-world is borderless and the sellers can seldom identify the buyers. Customers are generally willing to pay for this kind of payment guarantee service in order to reduce their credit risks. The open Internet often needs a connection of trust between buyer and seller (Figure 9.9).

Figure 9.9 **Bank-provided connection of trust among otherwise unconnected parties**



Providing trust is a part of the network structure and services of banks. Banks must agree among themselves on the rules for guarantees and on who bears the risks. Payment and payback guarantees always entail credit risks, but banks can insure customers against large individual

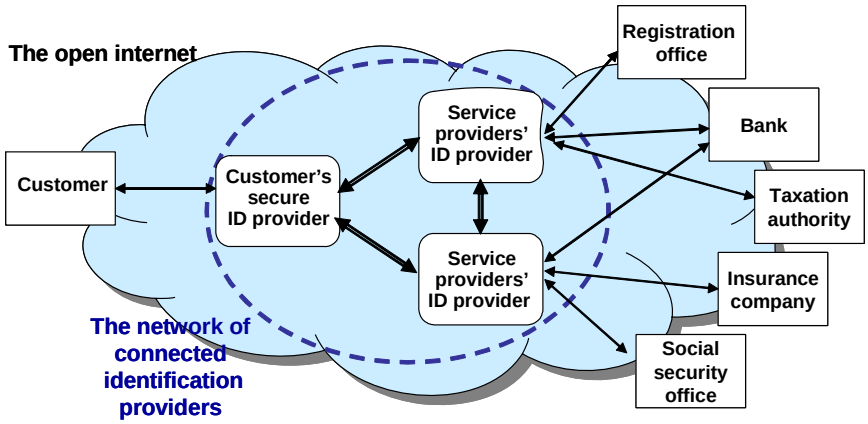
losses. In DVP-type services, the banks must agree on a DVP dialogue and the manner of controlling delivery of required e-goods.

In the paper world, such services have been tied to given payment instruments. In the e-world, the arrangements can be made more flexible and provided as an optional part of the basic common fund transfer service. The interest in using such services probably depends mainly on convenience and pricing considerations. If there is a sufficiently large demand to reduce average administrative costs to a reasonable level, this kind of value-added service could become widely attractive.

9.5 What kind of e-identification solution

Electronic identification will be essential for those e-commerce and other types of electronic services for which it is important that service providers can recognise the customer in a secure manner. The customer must be positively identified, for data privacy reasons and in case the order or dialogue is of such importance that the counterparty must be legally bound to the deal. Delivery of such electronic services will be hampered if there are no trustworthy identification services available. There will most probably be competing secure identification service providers for different regions and even within the same regions, as it is practically impossible to have just one service provider for the whole world, which would also introduce a very central single point of failure. The different service providers must establish a common network to provide interoperability and a common access path to all service providers requiring secure identification (Figure 9.10).

Figure 9.10 **Network of interoperable secure identification providers**



Banks could use the same network of trust (Figure 9.9) for providing customer identification services for other customer-to-customer identification. Companies providing e-business connections to their customers must be able to identify their customers in order to provide sufficient privacy. Insurance companies, service operators, tax authorities and other public authorities all have the same needs. Banks have been among the e-business pioneers and, due to the strict privacy requirements for banking services, they have been obliged to build secure identification systems. They are thus well placed to provide this infrastructure as a service for other companies. The Finnish identification service TUPAS[64] is an example of this kind of value-added service, which builds on the e-banking identification system. Banks could also provide identification services based on bank cards and PINs. One possibility for e-identification is to build on the banking services and the network of trust between banks.

Another private alternative could be based on the mobile telephone service providers systems. When we approach a situation wherein almost everyone has a mobile telephone, the phone could be used for e-identification purposes.[65] This would require that mobile telephone service providers can securely identify their customers, or at least those customers using the e-identification services. A third alternative

[64] See www.fkl.fi.
[65] See www.valimo.com and www.turkcell.com.tr.

would be for a government agency to provide modernised identification services suitable for the e-world.

A common e-identification service would benefit everyone. It would be expensive for each service provider to offer its own service and would be very inconvenient for the users, who would have to use different identification schemes and different codes for each service provider. This sort of many-to-many connections would not be practical when the number of e-companies with customer-identification needs is growing.

Irrespective of which provider group is to produce identification services, it must establish a trusted network across identification providers in order to ensure global reach. The certification authorities need to establish an internal network between them (see section 8.8).

9.6 Mobile payments

It seems that 'mobile payment' is now a buzz word. There are nunmerous m-payment trials ongoing in various countries. However, none of these have gained momentum at the international level yet. M-payment schemes can be broken down into three broad categories:

– e-payment interfaces using mobile phones
– digital cards stored on mobile phone
– truly new generation mobile payments with integration synergies.

The earliest versions of m-payment were generally extensions of e-banking, where certain telephone-banking and e-banking services were offered via mobile-phone SMS services. These enabled display of account balances and simple payments between bank accounts. In some cases, the scheme involved separate mobile payment accounts, identified by mobile phone numbers or other addresses more convenient than traditional long account numbers. However, these systems are generally inconvenient to use, because of the slow and not so user-friendly payment interfaces of first and second generation mobile telephones. However, the situation is changing rapidly. Smart phones using generation 3 or 3.5 of mobile communication are becoming popular. Moreover, the mobile phone will have the same Internet capabilities as a normal PC of today. Smart phones will then become e-banking terminals for many customers.

There are also several solutions in which the information contained in a payment card is stored on a telephone. The storage area can be in

the telephone casing, ie the chip normally embedded in a plastic card is simply embedded in the plastic cover of the phone. However, this type of solution will probably not be highly attractive in the long run. Storage of card data can also be located in an SIM (Secure Identification Module) card where the secure data for mobile calls is stored, or it can be stored on a separate secured chip card in the telephone. Just as today's mobile can efficiently store more photos than one's wallet, it can also store more cards in an intelligent and practical manner without limitations, because the payment card data is highly condensed. There are several essential benefits of using mobile phones for digital storage of card information. Separate plastic cards are not needed; instead, these are converted to digital cards on the phone. The card services are directly available once the data are loaded into the phone, and it is easy to change the digital card information online at any time. Customers will not have the problem of carrying separate cards around. The mobile phone payment application can remember the users' payment preferences for the different digital cards. Using RFID technology, the interface between phone and EFTPOS terminals can be made more efficient than with separate cards. Such a payment mode has been called 'push & go' or 'press & go'. The EFTPOS terminal sends the payment information directly to the customer's phone, and the customer can view the amount on the screen and then accept it by simply pressing OK or verifying the payment using his PIN on the mobile keyboard. In an online environment the payment could become final immediately.

However, since modern mobile phones are in fact miniature PCs, they can provide much more enhanced payment services, where new modes of integrated services offer considerable possibilities for new types of benefits based on the possibility of storing transaction data on mobile phones and updating and accessing the data efficiently via near-distance communications. One such basic service for customers would be automatic reconciling of payments based on the original acceptance. Today customers need to check, mostly manually, that the debiting of their accounts is done correctly, ie that all card payments, cheques etc are booked as agreed and that there are no extraneous payments or alterations of agreed amounts. When customers accept purchases via mobile phone, the transaction data can be stored on the phone and used for automatic reconciling against the bank's account statements. Customers need only to act when the phones report exceptions compared to the stored original acceptance information.

Another highly beneficial development is in ticketing. Already today, passengers can buy Helsinki tram tickets in trams via mobile phones and SMS messages. However, combining the increased

storage capacity, RFID technology and encryption possibilities of mobile phones, one could develop a general m-ticketing/payment convention. When paying eg for a tram, train, football or cinema ticket, the ticket and payment information would be stored on the mobile phone. The ticket information would be encrypted so that only the service provider could alter it, but the customer could read it. This provides a good possibility for automated access control to different kinds of events. The gates would open only if one is carrying a mobile phone with the correct ticket information, which will be accessed via RFID communication. Essentially, the gate system would ask your phone automatically if you have a ticket for the game, transportation vehicle etc and react according to the available information.

In order for the mobile phone to become a popular payment 'instrument', it must be secure. Mobile phone producers and telecommunication service providers need to design the internal processing environment of mobile phones so that different kinds of viruses cannot access the payment information or alter the screen or keyboard information. The mobile phones' processing environment needs to be more effectively protected than are today's standard PCs.

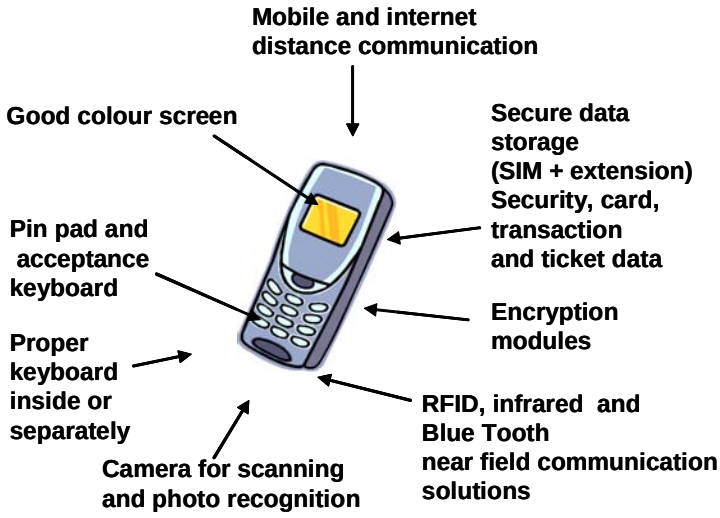
As mobile payments can be completely automated, they have the potential to replace most of the cash used today. This would require that providers of telecommunication solutions design an efficient low-cost online protocol for mass payment messages between mobile phones and account-service providers. The telephone hand set producers, telecommunication service providers and payment-account service providers must also agree on a common method for user identification and data encryption in a multi-service provider environment. This boils down to two basic but disputed issues: who owns the customer and who owns the necessary security device?

M-payments, like any electronic payment service, will require an account-keeping service provider. Because of the promising possibilities of m-payments, several groups of service providers are interested in this service. Telecommunication service providers want to compete with banks for customer accounts. New entrants that are based simply on mobile payments or that detect synergies eg with public transportation ticketing are also interested. The dispute over who owns the customer seems to be a coordination problem in this new area of business. M-payments would bring benefits, but in order to supply an interesting business proposal, it needs to build on a good 'use' case. This would require simultaneous interest among several coordinated parties, which can be difficult to muster so long as the business risks are formidable. Having the bulk of the services provided internally by a single service provider reduces the

coordination problem. For example, banks can be excluded from the development team if the payment accounts can be kept by telecommunication service providers.

The security device in the mobile phone is the physical kernel, and its usage requires cooperation and standardisation. Theoretically, one could imagine solutions in which several security devices operated in parallel within the same device, ie in several parallel slots. Customers could also physically switch the security modules depending on which one is needed in a given situation. However, none of these would be practical solutions. Nowadays, customers generally buy their mobile phones (albeit some are leased by telephone companies as part of the service agreement), and the mobile telephone operator supplies the SIM card, which identifies the agreement/user. If the SIM cards were standardised, so that customers could buy them separately and each service provider could obtain the part of the SIM card content assigned to him, the current security device would become more open. This would require that there be a trusted third party or government agency that serves as primary administrator of the SIM card's common security kernel. All other service providers would contact this primary administrator in order to install their share of this common SIM card. To open up the current SIM cards for such general use might prove difficult, due to legacy investment of telecommunication companies. If that is the case, then this general security device needs to be implemented as an extra security card on mobile phones by a suitable trusted third party. M-payments will not be sufficiently secure without the protection of a proper security device storing and encrypting the data in a secure and tamper-proof manner.

Figure 9.11 **Mobile phones contain all features necessary for a modern payment instrument platform**



The modern mobile telephone has all the features (Figure 9.11) needed for becoming the main payment device of most consumers for most payment types. It can also bring a new kind of beneficial reconciliation and ticketing service. However, these developments depend on coordinated developments by several service providers and their interest in coordinated joint developments. M-development will require major changes to legacy systems. The division of business could remain the same among the current service providers, but a general m-payment solution would require a new type of trusted service provider that would administer the necessary security services. In fact, there will probably be a need for several such trusted service providers, and hence a need for a trusted network among these service providers. This is essentially the same requirement that is found to be important for e-identity service providers. There would be definite synergies if the e- and m-identify service providers could be the same. Such coordination requires close attention, as it will be crucial for the development of open and general security solutions.

However, the service providers must also focus on customers' resistance to change. Surveys indicate that only a minority of customers see direct benefits from mobile payments. Both consumers and merchants will probably have to experience direct and concrete benefits before we see a take-off of strong growth in mobile payments.

9.7 Electronic substitute for cash

Cash has today become mainly a transient common means of exchange. Payers withdraw cash from bank accounts via ATMs and merchants deposit it back into their bank accounts. Cash is seldom used by merchants for payments, as they seldom make cash purchases. Cash is nowadays kept mainly for exchange purposes – not so much as a means of storing wealth – because there are better investment alternatives. An electronic substitute for cash could enable a more efficient transient transportation phase, as the manual sub-processes of cash would be replaced by completely electronic processes.

Cash has been the benchmark for private paper-based payment instruments. Private solutions need to be more efficient or provide other benefits in order to capture customers' interest. Providing interest on payment capital and/or credit have been such benefits. According to the cost studies in chapter 5, account-based instruments are more efficient for payments above a given threshold value. The continuous ICT development will probably bring new efficient mobile payment type of services to the market, which might be more cost efficient than cash for payments of all sizes. Should the central banks therefore consider modernising the cash services and provide an electronic substitute for cash?

Cash is a bearer instrument, that is, the physical note or coin carries the value. However, there cannot be electronic bearer instruments in the same physical meaning, because all electronic recordings of monetary values are merely streams of bits. Because there is always the possibility of making completely identical copies of a stream of bits, this option is open to easy forgeries. Any electronic money scheme will therefor, from the ICT point of view, be an account-based system in which transactions are recorded in a secure environment with strong access controls to hinder unauthorised transactions. This means that electronic cash can be economically viable compared to cash only when the costs for e-transactions are reduced below that for normal cash transactions. According to the costs studies in chapter 5, the break-even point is decreasing and card payments could substitute for a larger and larger part in the mid-range payments.

Paper-cash has following advantages over current card payment services

– convenience for small payments
– immediate finality

– person-to-person direct transferability
– independence of electronic devices
– anonymity.

In order to be competitive with paper cash, an electronic substitute would need to provide advantages over cash in all or at least most of these areas. Convenience would require that customers and merchants are able to use the service without investing heavily in new terminals or devices. Developments in mobile telephone technology point to the emergence of payment facilities embedded in all handsets and their SIM cards (see chapter 8 for details). This would also enable person-to-person payments when a normal mobile hand-set could function as both sending and receiving device with over the air authorisation controls. When mobile payments are made directly over the air in real-time, there can also be immediate finality. An electronic payment instrument can never become independent of electronic devices. However, the more dependent on our mobile phones we become, the higher the service level requirements become. Back-up facilities for device break-downs must also be improved. Mobile payments could thereby become the main payment instrument and paper-cash would only be used as a back-up instrument in case mobile services are not available.

Modern cash services require investments in ATM networks and merchant cash deposit facilities. These are expensive compared to the investments necessary for mobile-based electronic cash services, given the available mobile networks. The penetration rate of mobile phones is quite high also in developing countries. Today's mobile phones do not have all the required technology for an efficient mobile cash service, but as mobile phones are changed quite often – almost every 2–4 years – the necessary new functionality spreads quite rapidly. This could make it possible for some developing countries to 'leap-frog' to new e-cash technology and reduce their investments in paper cash technology. Examples of such developments can be seen in the different mobile telephone-based remittance transfer services.[66]

The issue is to what extent will the emergence of efficient, completely electronic and standardised payment interfaces require public service provision. Could open interfaces be established directly between service providers as in other network industries and could the settlements be made mainly in secured private settlement medias at sufficiently low risk levels? The reason for having a public electronic

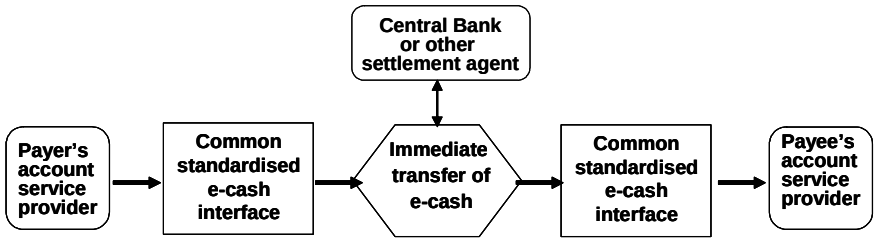
[66] Vodafone (2007).

form of cash would probably relate to a market failure in which the private service providers cannot agree on a sufficiently efficient and open inter-service provider infrastructure and interfaces for electronic payments meeting the general customer needs.

One of the basic services of central banks is to function as bankers' banks and provide cover transfers between banks across secure central bank accounts. In order to reduce systemic risk and increase financial stability, covers for payment flows are settled in central bank money. Currently, covers are transferred for retail payments at the ends of settlement cycles in batch mode, that is, transactions are queued to the end of the cycle and processed and credited only when cover settlements are made, in order to reduce settlement risk. In an immediate 24/7 environment banks would incur counterparty risks if they were to credit customers without simultaneously receiving interbank settlement. Central banks could facilitate immediate settlement by providing something called immediate e-settlement (for details, see section 10.5). In fact, that would mean that the current large-value payment services provided by central banks in the form of RTGS (real-time gross settlement) services would be extended to retail payments using network-based decentralised technologies. This would require that the costs of immediate settlement will be very low. Private systems could also contain these risks sufficiently well, especially for retail payments, using for example collateral arrangements.

A public electronic substitute for cash would need to facilitate real-time finality in electronic transfers from payer to payee accounts. This means in practise common interface standards for making the immediate transfer from payer's account to payee's account. There are currently several different card schemes with different standards, new and expanding e- and m-payment schemes and several interbank clearing facilities. A public transfer mechanism could provide coordination and common standards in order to reach open interoperable systems among the private service providers. The electronic substitute for cash would provide the standardised interlinking bridge between payer and payee accounts, including cover transfer between the service providers (Figure 9.12). It would in essence become the default interface standard for all liquidity accounts and would execute transfers between accounts immediately via these interfaces.

Figure 9.12 **Basic processing pattern of a possible future public electronic substitute for cash**



In a real-time world, the electronic cash is needed only during this conversion and for a split second. The payer withdraws electronic cash from his account to give to the payee, who will immediately deposit it on his liquidity account. The payment can be immediately final in the real-time environment we are heading towards. The main benefit of this kind of cash substitute would be in its standardised interfaces. In practice, such common interfaces could replace all the different current payment conventions and standards, resulting in the new synthesis for a new dominant payment method, as described in the conclusions of Chapters 2 and 3. An immediate completely electronic credit transfer type of solution containing sufficient data could replace the current conventions due to its higher efficiency and service level.

The need for a public payment service benchmark will depend on the level of competition among private services. If the competition authorities are able to maintain a sufficient degree of competition within the private services provision, the competition benefits of a public scheme will be very limited. There could in fact be a risk of the public service crowding out efficient private alternatives if a less efficient public service is subsidised out of public funds.

Establishing a new payment convention and infrastructure requires investments and risk taking in order to overcome the initial 'chicken-and-egg' barrier. Any new payment system will require start-up investments, and the volumes will start to grow only gradually. However, the service offering needs to be priced already from the beginning according to mass volumes in order to attract customer interest. This will mean that the break-even point will be reached only after a longer period, generally several years, which is often a barrier for private investments. Public infrastructure investments can, on the other hand, be made on longer terms if there are general benefits for the economy.

The anonymity of cash seems to be a highly valued feature, which is absent from traditional card and other account-based payment services. In fact, authorities generally require service providers to identify their card and account customers. In the same way as anonymous mobile telephone accounts can be opened by buying prepaid telephone cards, prepaid payment cards can be bought using cash payments.[67] Then paper-cash is used to ensure anonymity when loading value to the prepaid account for efficient electronic small value payments. Basically, this provides customers with numbered accounts for payment purposes. This is one of the paradoxes in the current payment environment in which cash transfers are anonymous, but plain numbered accounts are forbidden in most jurisdictions. It would be possible in the electronic environment to provide different kinds of intermediate solutions, in which anonymity is possible to a certain degree, that is, outsiders would see only the encrypted identity information, but for special controlled purposes the issuer could provide information on payers to other authorities or contact the payers, for example, to facilitate clearing of error situations. The central bank could be the trusted party as the issuer of electronic cash, who would provide the required anonymity level. However, it would require trust in the third party providing the anonymity screening. The support for complete anonymity will probably be discussed intensively in future, as it promotes many forms of criminal payments.

Due to general developments in ICT, the need for a separate micro/low-value e-cash service seems to vanish as the costs of traditional e-payment instruments decrease. The traditional instruments will be able to economically process a wider range of transactions. This can be compared to emails, which can nowadays carry anything from short messages to large books. The possible benefits of public service provision of a modern electronic substitute for cash in the format of a mobile payment or similar convention would be

– providing a new level of public benchmark for payment services
– ensuring trusted and controlled anonymity
– speeding up developments and investments in new technology
– introducing common standards for payment interfaces
– providing immediate interbank settlement services.

[67] For example anonymous prepaid Mastercard payment cards are already available see for example www.idtprime.com.

Current developments point to a gradual replacement of cash due to the increasing efficiency of such improved traditional instruments as cards payments and emerging mobile payments. The need for and benefit of authority involvement in the form of direct provision of electronic retail payment instruments seems very low. The efficiency of payment services can probably be better ensured via interventions promoting the efficiency and rapid development of private payment services.

9.8 Summary of potential service developments

The payment industry is in a great need of common international customer standards. The account addresses need to be standardised using IBAN (International Bank Account Number) or some other clear addressing convention. The payment messages need to standardised and converted to more flexible and open structures. The use of XML schemes and structured dialogues points to the creation of a common financial transfer message (FTM) for use in all phases of all types of payments. The basic credit transfer requires a common design for screen and printing purposes so that customers around the world can recognise a general credit transfer instruction. Common and open standards will have a cost reduction impact as well as a competition-increasing impact.

Implementation of e-invoices is by far the most rewarding payment development in progress. It will enable integration and automation of internal payment processes by end-users. The increase of low-cost electronic storage makes it possible to provide e-archiving solutions with all the details included in the e-invoices. Implementation of e-invoicing will result in major changes in the way we process and pay invoices.

Banks have developed an interbank network of trust. This can be used for providing payment and delivery guarantee services. E-commerce in the borderless Internet environment would benefit from added-value services like different kinds of guarantees. The same network of trust could be used for general customer identification services. Banks need good customer identification systems, and they can provide this service also to other service providers that need secure customer identification. Good e-identification is in some business areas a necessary condition for e-commerce growth. E-identification will require good cooperation among private service providers or a government scheme for open citizen usage.

Mobile payments constitute an expanding area of business. The speed and versatility of mobile communications are increasing rapidly and this will bring about a convergence of m-banking and e-banking. Mobile phones can also be used as storage for digital cards and thus render plastic cards obsolete. However, the greatest benefits would accrue with a proper 'push&go' payment interface and by including e-ticketing functions. An efficient implementation of mobile payments would require an open security and identification solution, which can be connected for synergies with the general need for e-identification. An efficient mobile payment system would probably crowd out a large part of the current paper cash usage.

As current developments points to a gradual replacement of cash by improved traditional electronic payment instruments for example cards and emerging mobile card payment versions, the need for direct public service provision in the area of electronic cash seems very low. The efficiency of payment services can probably be better ensured via interventions promoting the efficiency and rapid development of private payment services

As pointed out earlier, customers change their payment habits slowly and any new payment service will require several years of marketing and implementation efforts before wide usage is achieved. The service providers face a coordination problem when the changes must be made (almost) simultaneously in so many systems in order to support new technology or features.

10 Expected market and infrastructure developments

As described in previous chapters, the payment industry seems to be on the verge of a new era. The old paper-based payment conventions will be replaced by redesigned electronic payment instruments. This is likely to have a major impact on the market and the payment infrastructure. At the same time, the limited capabilities and the frictions of change in the current infrastructure will probably delay developments. The essential question to ask is: when is the most advantageous time for change? Another important concern is how the change will be effected – by gradually changing the current systems or by building a completely new infrastructure in parallel starting (almost) from scratch. In the latter case, the old and new technologies would run in parallel for a time and the volumes would be converted step-by-step to the new technology. In many other industries in the same situation, the option of starting from scratch has been used, but there are also examples of developments based on gradual improvements. The route often depends on who is initiating the change, old players in the market or new entrants.

10.1 Examples of the impact of technology changes on other industries

There is generally a fairly long time lag between the invention of a new technology and its wide usage. For the steam engine, the lag was more than a hundred years.[68] However, the implementation of transistors was already much faster, practically only 15–30 years, and the impact of transistor technology has been enormous during the past 60 years since its invention.[69] The development speed is clearly increasing. It seems that there are three general cases of how new technologies are introduced:

[68] Edquist and Henrekson (2007).
[69] Edquist and Henrekson (2007).

– via completely new entrants
– via other industries based on new synergies from the novel technology
– via evolution in the current industry.

When the invention occurs outside of the current industry and far from the focus areas of the current industry the technology often reshapes the whole industry. One example of this is the introduction of digital calculators that overtook the market of mechanical calculators almost overnight, so that most of the mechanical calculator producers went into bankruptcy and the whole industry moved to other geographical areas.

When the innovation is based on synergies with another industry and the technologies are developed there, the new industry will conquer the market due to its superior performance. The old industry cannot compete, as it cannot provide the same kind synergies. One example of this is the increasing versatility of mobile hand sets. It will be more difficult for calendar providers, camera producers, door/car key system providers, dictionary services etc to provide separate functional platforms when the mobile hand set can contain and integrate everything via the synergies of functionality.

In several cases the current industry has had enough development power and has been able to design new generations of services based on new technologies. The telecommunication industry seems to be such an industry, being able to move successfully from copper line-based voice services to wireless multimedia services, although Skype[70] and other new entrants have raised the level of competition and reduced the margins of the traditional service providers.

The payment industry clearly faces a huge development challenge. New technologies provide completely new possibilities. When should the changes be initiated? Which technologies should be chosen? What are the best designs and structures? How should the undertaking be organised and how should consensus be created? Which of the scenarios presented above is the most probable? Who will run payment services tomorrow: PayPal-types of new entrants, mobile phone or Internet operators or banks as before?

[70] www.skype.com.

10.2 Bank versus non-bank service providers

Banks have been the traditional service providers for payments. There are also some niche service providers for special segments such as travellers' cheques, cash remittances and credit cards, which have provided special services without a banking license. These current niche players have not shown any intension to expand outside their current market segments. However, there are also new players with more far-reaching strategies and based on synergies with their current services and on the use of modern technology for improving payment services or cutting costs.

The power of innovative use of new technology is well exemplified by PayPal, which provides a basic real-time credit transfer service that employs modern web technology. PayPal has a simple real-time account database with a normal account balance for each customer. The payments are effected via emails.[71] The email address and/or telephone numbers function as the logical account identifiers. When a customer wants to make a payment (credit transfer) he just sends an email to PayPal stating the amount to be transferred and the receiving account, which is simply the receiver's email address. PayPal debits the sender's account and credits the receiver's account and forwards the email to the receiver's email address as confirmation and remittance of transfer. The payer has the option of sending a message to the payee as part of the email. In order to move money in and out of PayPal's closed system, a customer must use a conventional credit transfer or card payment. PayPal has only added the amount and account structure behind the normal emails and created a very low-cost payment infrastructure based on what is available to all market participants. The growth has been tremendous. PayPal now (August 2007) operates in 17 currencies and 190 markets and includes about 150 million accounts around the world.[72] Using new technology and starting from scratch provides a good opportunity to cut costs considerably, compared to legacy systems, in times of notable changes in processing technology.

PayPal started in close cooperation with eBay in Internet auctions. Other Internet service providers, like Google[73], Yahoo[74] and

[71] www.paypal.com (PayPal provides also more advanced services like payments initiated using mobile phones and e-invoicing).
[72] www.paypal.com.
[73] www.google.com.
[74] www.yahoo.com.

Microsoft[75] could also be in a position to provide e-payment services as part of their Internet products. Other companies with potential synergies with their current line of businesses are transportation companies, telecommunication/mobile phone service providers and retail/gasoline chains. All of these are so big that they can afford the necessary developments and also a bank license if there is a regulatory need. The Oyster card[76] for London Public transportation provides an example of transport company offerings. Most telephone companies provide extra charged service numbers; and it is only a short way to expanding the use of prepaid phone time into a means of exchange. Phone companies keep on-line accounts for telephone bills, and adding other types of bookings to the accounts would be fairly simple. Combining this with the new features of mobile phones would create a 'handy' payment instrument. Retail changes like Walmart, Tesco and the Finland's S-chain have developed payment and banking services based on large customer bases. However, in order to provide world-wide services these companies need to establish a world-wide service network and presence.

The new entrants have several advantages over the current legacy payment service providers:

– they already have experience and systems in place that use the technology in their main business areas
– like the banks, they already serve large customer bases, with everyone making payments
– the can provide value-added services to their customers via integration and synergies with their main services, eg e-commerce or m-commerce
– they can make good profits already at low price levels, as they do not face the costs of legacy systems
– they can both cross-subsidise out of and/or embed payment charges within their main business services and thereby thrive also in subsidised markets.

The improved services and lower costs provide the basis for these new entrants to capture markets from the legacy systems. The wider the gap between old and new forms of payment services, the easier and more profitable it will be for new entrants to capture the market. Banks might find themselves one day out of the market if they do not

[75] www.microsoft.com.
[76] www.tfl.gov.uk/oyster.

fill the development gap themselves. Once the customers have moved to one service network using the new technology, it will be difficult to move them to a competing network due to the network effects.

10.3 SEPA and international standardisation

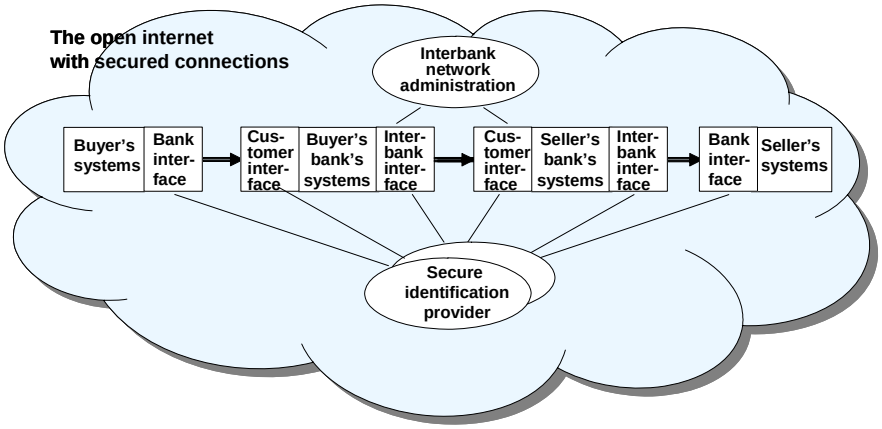
The SEPA (Single Euro Payment Area) is a huge project for harmonising and standardising the main payment services in the euro area. There is no other current payment development project matching it in size. It may be one of the main drivers for common international standards, if the project results are transferable to even wider international usage. This will depend much on whether the SEPA design and standards prove to be the wave of the future. If the outcome is a mere harmonisation of European legacy batch systems and services, it will hardly be the wave. Other more modern designs and standards will take over in due course. However, if the SEPA process provides an effective means of achieving the new generation of e-payment services, it will be well placed to show the way to efficient international design and standards. This will require that SEPA developments proceed from the perspective of the future needs of customers and the possibilities offered by modern technologies. Until now, SEPA development has been largely about creating the basic starting point for SEPA, ie harmonisation of the legacy environment. The next developments in e-payments, m-payments, e-identity and e-invoicing will show the degree to which the SEPA community is orientated to future developments as compared to other development communities.

10.4 Infrastructure and payment network developments

The previous generation of payment infrastructures was mainly based on batch processing centres whereas the new generation of infrastructure will be network based (see Figure 2.4). The Internet technology provides an opportunity to have all service providers directed connected in real-time. The new type of infrastructure requires a network administrator as the central point, but does not require a processing centre for all transactions. Payments will in future flow directly between account service providers just as emails now

flow directly between email account service providers. Both customers and banks operate in the same Internet environment and can use the same secure identification service providers in order to build secure connections. The infrastructures in the e-world are simple and flat (Figure 10.1).

Figure 10.1 **Simple flat infrastructure of the e-world**



SWIFT already supplies, via SWIFTnet service, an Internet-based network connection between banks. However, most of the payment transactions still flow via the old store-and-forward network. SWIFT is the backbone for cross-border traffic, but the bulk of domestic payments move in dedicated national networks. In the real-time world, the selection of network service providers could be more flexible, as the sender would always get direct feedback on the success of a message and could the reroute the unsuccessful ones. The message routing will therefore be more open to competition.

The payment network and clearing house functionalities will therefore shrink considerably in the new era of payment networks. The network administrator is needed to maintain participants' registers, including addresses, cross-reference tables, security keys etc. However, these can be largely automated. The network service itself will simply be a basic data communication facility. The payment infrastructure, which provides the basic transaction processing, will be function completely in the interface servers of the service providers (again, it is instructive to compare with email servers). In a highly standardised environment, the software for these interface servers will become 'off the shelf' applications, which can be run on the servers at the server provider's ICT site or in an outsourced server hotel.

In the network-based processing environment, key for the common infrastructure is the message and dialogue design. This will be the major task of the infrastructure management entity and will change from a payment and banking industry-specific task to more of a cross-industry task. In this kind of network message processing environment, the required basic message transfer services will be the same for payments, security, insurance, trade documents etc. The payment industry can use the same structures that are built for the other data communication needs. The legacy burden of the current payment infrastructure may result in some intermediary generation of payment networks before moving to a common non-industry specific solution. However, if the design of the new infrastructure generation starts from scratch, eg along the lines of PayPal, then the payments could be converted quickly into general communication infrastructures. Compared to other pure data communication needs, the payment industry also needs to transfer cover and settle payments, which requires an additional layer, as described in the next section.

10.5 Developments in interbank settlement and cover transfers

In the current generation of batched payment transfers, a central entity – clearing centre or settlement bank – calculates the cover-transfer needs for payment system participants at the end of the clearing/settlement cycle/batch. Each participant with a sending surplus must pay those with receiving surpluses the necessary cover. It is always a zero sum game, where the total sum of surplus positions equals the total sum of deficit positions. When the process is converted to real-time transaction-based processing, each payment will also require its own settlement booking. All transactions are individually booked in customer accounts and all interbank payments are also booked in interbank accounts.

The interbank cover transfer accounts need to be kept by a settlement agent/bank that is acceptable to all service providers. The network effects drive the interbank settlement towards a natural monopoly provider. If there were more settlement agents, the service providers would face a more complex task of selecting separately the settlement agent for each transaction and of securing sufficient liquidity for the different settlement agents. In order to ensure the security of the settlement assets, these have been central bank claims

or clearing house claims backed by central bank funds or other secure collateral.

There are essentially two possible setups for real-time cover transfers:

– totally centralised
– decentralised with centralised control.

The completely centralised setup requires that all retail interbank transactions be booked in one centralised system. This introduces congestion problems and a single point of failure. It also conflicts with the general decentralised design of the Internet. In the decentralised alternative, each service provider functions within continuously updated decentralised balances or limits within centralised control. The decentralised concept of settlement – called e-settlement[77] – can be employed by either a private or public settlement agent.

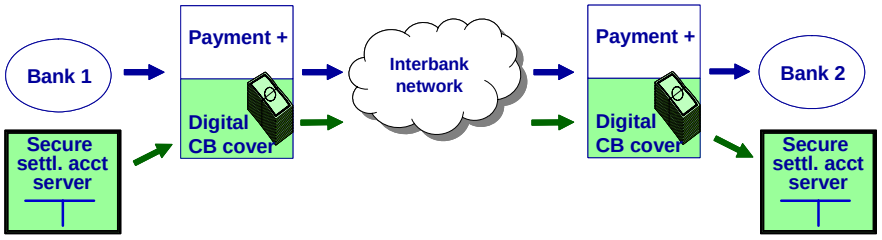
The basic idea of the e-settlement is that central bank cover is attached in digital format to each payment (see Figure 10.2. It can be pictured as a central bank cheque attached to the payment. It is a strongly encrypted enclosure to the payment containing the settlement transfer. It can only be created and reopened by the software in the secure settlement account servers. At the sending end of the payment, the settlement account is debited, and at the receiving end, the settlement account is immediately credited. The receiving bank can thereby directly reuse the settlement liquidity for outgoing payments. From communication point of view the cover note is just an encrypted enclosure attached to the payment.

The secure settlement account servers can be pictured as completely automated central bank branches keeping one or several settlement accounts. In a truly distributed solution, each bank would have their one secure central bank box working at its site. The servers could also be located at the central bank premises, and the banks' payment servers would request an e-settlement note to be attached to each payment from this e-settlement server site. In an environment with several currencies, banks' payment servers would send the requests to the relevant currency servers. The basic benefit compared to the e-settlement server approach is the avoidance of congestion and single point of failure risks and having all real-time payments flowing via the one and only settlement system and application. The e-settlement approach allows the settlement accounts to be distributed

[77] For details, see Lienonen, Lumiala and Sarlin.

across any number of settlement servers. This is important when the real-time settlement approach is expanded to all sizes of payments and not restricted to the large-value payments currently processed in centralised applications.

Figure 10.2 **Basic structure of the distributed real-time e-settlement approach**



The settlement process will become a highly automated and low-cost process. Thus there will be very little to gain by having parallel competing solutions. Settlement will in future be a commodity process, and a central bank money-based solution will provide a very secure settlement mechanism. A general and open solution developed in cooperation with the industry would probably become a much used service.

10.6 Summary of market and infrastructure developments

Current market developments point to new entrants capturing at least part of the current payment markets. New entrants have for many years already been able to develop and sell new and more efficient payment services without the old industry taking competitive actions. If the traditional banking industry does not upgrade it development efforts, it will likely be out-competed by the new and more development-hungry entrants.

The current payment infrastructure has been developed specifically for payment transfer purposes. In future the payment transfer needs can be satisfied with general data transfer services, and the payment infrastructure parts will reside in the interface servers of the account service providers. The functions of centralised clearing centres will change to administrative tasks of register and cross-reference

maintenance. However, the special need for cover transfers must be handled in a manner suitable for distributed network processing and combined with the real-time transaction-based processing of payment messages along the lines described in the e-settlement proposal.

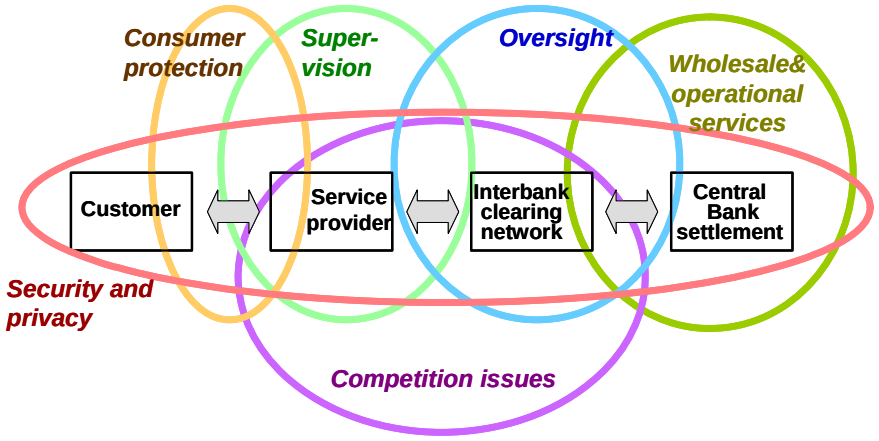
SEPA is a huge infrastructural undertaking and its survival will depend on how future developments unfold. There is a risk that it will only be a last effort for regional legacy system harmonisation, if it cannot manage the process of moving to the new network-based infrastructure design and developing future proof e-services. This is again dependent on the effectiveness of SEPA governance.

11 Authority involvement and challenges

Authorities have throughout history been involved in payment instruments in various ways. Authority mandates are generally given by laws proposed by Ministries and passed by Parliaments. Payments play such a central role in a modern society that they are controlled and monitored by authorities in several different perspectives (Figure 11.1):

- the oversight function focuses on stability and efficiency of the payment infrastructure and the basic design of payment instruments
- supervision focuses mainly on stability and risk management of individual service providers
- consumer protection plays an important role, as consumers are very dependent on payment services
- competition issues are central, as functioning payment services require close cooperation among competitors
- security and privacy issues are essential, as payment services require public trust
- public operational services are provided especially for the interbank wholesale market.

Figure 11.1 **Authorities perspectives on payment systems and services**



Several authorities are involved in these functions, often in an overlapping way. Central banks are entrusted with general oversight tasks and operational payment processing tasks. Financial supervision is performed in some countries by central banks and in other countries by a special financial supervisory authority. The central bank and/or financial supervisory authority are in some countries entrusted with consumer protection, while other countries have created a special consumer ombudsman to handle it. Competition issues seem to be controlled largely by special Competition Authorities, but certain tasks regarding competition may be delegated to other authorities, eg the gathering of price information. The security and privacy issues are often divided among several authorities, like Data Protection Agencies, Police Forces etc. This description is only a general one, as the setup varies from country to country and the responsibilities of agencies can differ and some of the tasks can be handled directly by Ministries.

In order to perform their tasks, the authorities are given various implementation tools, eg possibility of data requests, inspections, operational involvement, licensing, regulatory power and sanctioning.

The reason for the heavy involvement of public authorities is found in the differences in objectives between private companies (profit maximisation) and public authorities (social welfare maximisation). Due to the large network externalities of payment services, authority involvement is required to ensure solutions that increase the social welfare. For example, cash was introduced as a public means of payment with legal tender status to ensure the stability and value of notes and coins in circulation and to provide a generally accepted means of payment, at a time when notes issued by private banks continuously faced problems of confidence due to frequent bankruptcies.[78] Authorities can also take a much longer view of infrastructure developments than can private service providers, which are limited by short term budget constraints. There are also big differences in the perceptions of company risks and society/citizens' risks.

Changes in customers' payment habits and in payment system infrastructure and services will also influence the authorities. These changes require adaptation and alertness by the authorities. Authority organisations are political institutions governed by political objectives, which in the end require a high degree of general acceptance by the public. Authorities therefore reflect a conservative bias. Actions based

[78] Born (1983), Kindleberger (1987).

on past experiences and political structures familiar to the citizens are easier to defend than novel future-oriented actions. Authorities are probably more risk averse in their service production than private organisations, as political bad will due to malfunctions, safety problems and the alike are easily criticised by the public and newspapers. On the other hand, the authorities' costs are less assessable due to budgetary opaqueness and lack of benchmarks. There can also be conflicts of interest where public authorities provide services in competition with private entities, eg in the form of hidden subsidies or regulatory relief. A conservative stance functions quite well during stable times, but can be inefficient in times of change.

The objective of this chapter is to describe the new challenges of authorities due to the anticipated developments. The main developments affecting authorities in the area of payments are:

- increased globalisation
- higher speed
- shorter reaction times
- more consolidation in the markets
- deeper integration among all participants in the payment process
- increased interdependence among institutions and systems
- larger risk of wider contagion on the international level
- greater complexity of the market and its infrastructures.

Any future risk situation will be much more complex than before and will require more cooperation among authorities. Authorities need also to increase their possibilities to use and control electronic processes. International cooperation among authorities will be essential, because the days of national services and infrastructures will soon be history.

11.1 Oversight concerns: stability and efficiency

The Eurosystem and the Bank of Finland as Eurosystem participant are entrusted the task of promoting the smooth operation of payment systems (Treaty Establishing the European Community Article 105.2). The Act of Bank of Finland (section 3.3.) stipulates that the Bank of Finland shall participate in maintaining the reliability and efficiency of the payment systems and its development. This task is often called oversight and is divided into a stability objective and an efficiency objective. Essential for all payment instruments is that the users have

confidence in the service. As customers are dependent on payments, the services must be operationally reliable. The system needs to record all payments correctly and there should be only a sustainable amount of security problems like fraud. Central banks are especially interested in the credit, liquidity and operational risks of payment systems and their proneness to be contagion systemic risk. The payment services need also to be as efficient as possible and suitable for the economy in general. Service content, delivery times, processing costs etc should be in line with best practices.[79] Central banks emphasise payment systems and instruments while supervisors focus on risk and risk management within financial institutions.

The term 'oversight' is quite novel; it was only in 2001 that the G10 Committee on Payment and Settlement Systems published its Core Principles for Systemically Important Payment Systems[80], which can be seen as the basis for the oversight efforts of central banks today. The ten principles set out can be seen as the minimum requirements for a robust system design. These have been applied to oversight of large-value and retail payment systems by the Eurosystem in the euro area.[81]

Oversight has until recently been largely a national task, with the focus on national systems, national participants and national instruments. The developments foreseen and described in the other chapters will fundamentally change the practical oversight work. Systems will become international via consolidation, the main volumes will come from big multinational banks and instruments will become standardised at the international level. SEPA developments point clearly in this direction. National systems, banks and instruments will almost disappear and will be replaced by global or at least multi-country entities. The mandates of national overseers will not be sufficient to control systems residing in other countries. The national oversight policies thus need to be transformed into an international global oversight policy. This can be done via cooperation among national overseers or by creating cross-region and/or international overseers. In order to reduce cross-border risks, it is essential to harmonise oversight requirements and reduce contagion possibilities.

Institutional and technical integration increase mutual dependency in payment systems. The same main international institutions and banks participate in several systems and have major business

[79] See BIS (2001), ECB (2000) and ECB (2003).
[80] BIS (2001).
[81] ECB (2003) and ECB (2000).

relationships with each other. Problems hitting one central participant can therefore be transmitted to several systems. Further institutional consolidation will increase these risks. All major payment systems are electronic and dependent on a limited number of ICT service providers. Many of these constitute single points of failure. These kinds of essential ICT components can be hidden deep in system structures in the form of database components, security devices, communication routers etc. Sufficient hardware backups are generally available at central spots and software updates are well controlled, but there are seldom real alternatives to critical software. One typical example would be the increasing dependence on SWIFT as the message router in some central segments of the payment infrastructure. In future the oversight of central banks will have to focus more on the issue of dependencies. The required risk mitigation solutions and system robustness designs need to follow the market and technical developments.

Processing speed is moving step-by-step to real-time processing. The financial markets are clearly moving from a mainly day-based market towards a 24/7 market. This requires online security controls and registers immediately updateable by banks in order to control risks. However, it will also require continuous monitoring by overseers and short reaction times. Liquidity shortfalls and drainage can quickly stop payment flows, and central bank assistance may be needed to resolve such situations, which can easily expand internationally due to the increasing dependencies.

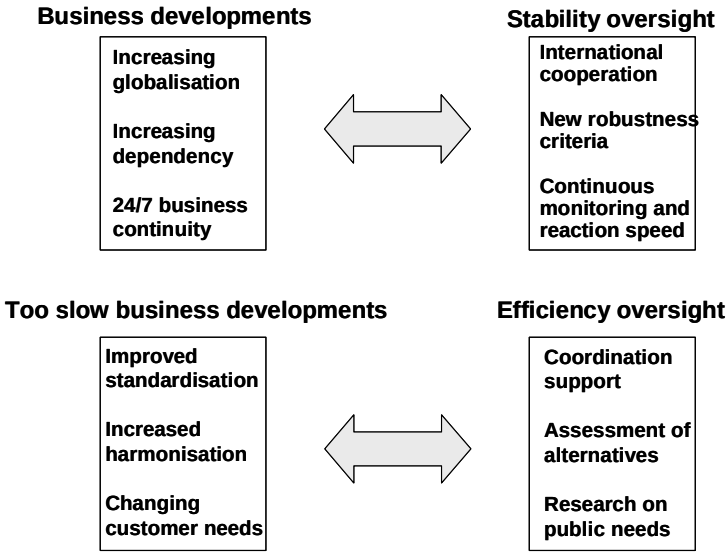
The industry has an interest to promote cost efficiency to a degree, but there are areas in which the industry interests conflict with those of users and the general public. This is the focus of special oversight efficiency. Central banks are needed to speed up developments in areas where there are important customer interests, but a lack of interest among service providers hinders development. For example, the payment industry often has an interest in prolonging the use of legacy solutions, although it would be in the customers' interest to move sooner to the next generation technology. This disinterest is mainly due to a lack of competition and to the custom of cross-subsidisation, which remove the normal income benefits of payment developments and put an emphasis on sub-optimal minimising of costs within the banking industry without encompassing customers' cost considerations.

Typical oversight efficiency issues are standardisation, open access, harmonisation of rules, customer requirements and delivery times. It seems that the industry often has difficulties to decide on a coordinated change process, and the central bank is needed to enforce

coordination in order to assure efficient developments. This requires central banks to assess different alternatives and to study the needs of the public.

The oversight of payment systems therefore results in a two-directional approach in which central banks must find a good balance between efficiency and stability (Figure 11.2).

Figure 11.2 **Oversight balance between stability and efficiency**



The central banks have a variety of tools to enforce their oversight stance, eg moral suasion, recommendations and regulations.[82] These need to be actively used when central banks want to accelerate developments.

11.2 Supervision and deposit insurance concerns

The task of supervisors are to evaluate risks and risk management in the financial markets in general and specifically in the institutions (eg banks, payment institutions, investment companies, clearing houses,

[82] BIS (2001).

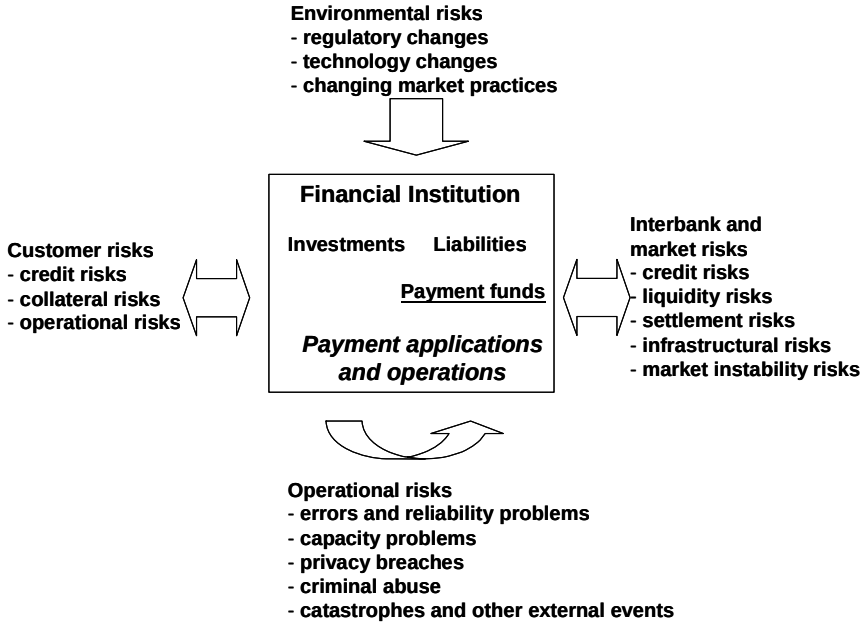
stock exchanges) operating in the market. Regarding payment services, the most important supervisory issue is to ensure the safety of the payment funds residing in customer accounts of financial institutions. This is often done in cooperation with a special deposit insurance authority or fund. Customers would rapidly abandon payment services that cannot protect their funds. Historic experiences have shown that special external authorities are needed for this task, in addition to internal audits and market control. Licensing, regulations, recommendations and inspections are the tools generally used by supervision authorities. Deposit insurance authorities use different forms of insurance contributions to cover payouts.

The Basel Committee on Banking Supervision published its Core Principles for Effective Banking Supervision in 2006.[83] Included in the 25 principles identified therein are the following issues which are important for payment services: the objectives of supervision, licensing criteria, capital adequacy, risk management processes, credit risks, exposures, liquidity and operational risks, abuse of financial services, consolidated and cross-border supervision.

Financial institutions face considerable risks in payment service provision (Figure 11.3): changes in the operating environment, and the risks associated with interbank and market credit, liquidity and settlement. Credit and operational risks are present in all customer dealings and internal operational risks need to be controlled. The financial institutions must have enough reserves to bear these risks.

[83] BIS (2006).

Figure 11.3 **Financial institutions and payment system risks**



The central task of supervisors is to ensure that internal risk management and control methods are adequate and are employed. The main challenges facing supervisors are globalisation in two forms; cross-border relationships among traditional supervised entities and new non-traditional international service providers. The conventional national supervision mandates are not sufficient in either of these areas.

Globalisation and consolidation create multinational entities with a common balance sheet, but with branches and subsidiaries in different countries. Such structures will require close cooperation among supervisors. Current deposit insurance systems are based on non-harmonised national solutions. Limits on the payouts, regulations on covered funds, participation rules, premium calculation methods etc vary greatly even within the EU area.[84] However, customers in the e-banking environment can freely use banking services from any country. In some cases, the customers are probably not even aware under which jurisdiction their accounts are kept. As payments

[84] European Comimission Review (2006b).

constitute a transfer of funds service and these transfers are increasingly between jurisdictions with different insurance protection schemes, it will be necessary to define more precisely the protection of moving funds.

There is a growing number of non-traditional payment service providers. Telephone and communication companies provide new electronic payment services. Retail chains are also showing an interest in this business area. There is a multitude of different Internet and mobile payment systems starting up. Some of these are already carrying large volumes like PayPal and have also applied for banking and/or other types of payment institution licenses in some countries although they operate worldwide. The Payment Service Directive (2007/64/EC) will create a new type of financial institution – the payment institution. Supervisors need new methods and mandates to supervise these kinds of systems. Some of these Internet payment systems can function from countries with completely different supervision requirements, which results easily in regulatory arbitrage and increases customer risks. The customers can be completely ignorant of the risks relating to such systems. The supervisors and other authorities then have at least the responsibility to alert consumers and other users on the risks they are taking in using non-supervised service providers.

11.3 Consumer protection concerns

Consumer protection has become a separate public service in the EU countries in the late 20th century. The need for consumer protection has increased with the consolidation of the economy. Companies have grown and single consumers have found it increasingly difficult to defend their right of fair treatment. The EU Comission has identified Ten Basic Principles for Consumer Protection in the European Union.[85] Especially important for payment services are that one should be able to buy whatever from wherever, that contracts should be fair to consumers, that price comparison should be easy, that consumers should not be misled, and that there should be effective redress for cross-border disputes regarding payment services. In payments, the main areas of consumer issues have concerned service rules, changing of service rules and prices, access rights/possibilities and customer responsibilities. The changing of payment habits

[85] European Comission (2005a).

towards e-banking and e-payments will put a new focus on security issues and customer know-how requirements.

As a result of a long debate within the European Union, the new Payment Service Directive (2007/64/EC) states in a harmonised way and clearer manner the consumer/user responsibilities for payment instruments like cards. Customers have the responsibility to safe-keep the instrument as described and to report stolen or missing cards. A customer has a limited responsibility for a lost card until the reporting is done. In cases of disputed transactions, the service provider has the primary burden of proof.

In case of a physical object like a payment card, these rules are generally understandable to customers. In case of completely digital services and instruments like e-banking or mobile payments, the average consumer's know-how will probably not be sufficient to establish the same level of safekeeping as for physical instruments. Digital security information may be stolen from a user PC, without the customer being alerted to it. The customer may provide security information to unauthorised persons via Internet, because he cannot discern the fake connection. He may need improved firewall systems, but he is completely ignorant of this need due to lack of ICT know-how. The banks and consumer protection authorities need to agree on consumer responsibilities in the growing e-/m-world, which are understandable and implementable for the majority of the customers.

Another topical issue is the exclusion of persons without sufficient e-knowledge and e-devices for basic electronic payment and banking services. In the Finnish Credit Institutions Act (121/2007), the basic bank services including payment services have been declared basic services to which every citizen is entitled. Especially the older customers find it difficult to follow the rapid e-developments. The current debate on moving to digital TV broadcasts and the new viewer requirements is a good example of the increasing digitalisation and its impact. There will be a risk of economic exclusion, if e-knowledge and Internet or mobile interfaces become a requirement for basic payment services. This exclusion fear was clearly seen in the responses to the consumer payment survey conducted by the Bank of Finland on future payment habits.

Globalisation and the borderless Internet pose the same kinds of problems for consumer protection agencies as for other authorities, when payment service providers are outside of the national and regional area with harmonised consumer protection policies. Customers need at least to be alerted to these problems.

11.4 Competition and fair trade aspects

The primary challenges facing competition authorities in the area of payments seem to be globalisation, privatisation and competition in network industries. Payments have been processed in national infrastructures based on traditions and old conventions. The payment industry is now facing rapid changes, which will also affect competition within the industry.

The competition issues in payments have lately got more attention in several countries. In UK, the Office of Fair Trade has been active in payment services and the so called Cruickshank report[86] started off the new policy towards increased competition. The Reserve Bank of Australia has been active especially regarding card payments.[87] European Commission DG Competition has in Europe done in depth fact finding on competition in retail banking and card payments.[88] The OECD has also had a working party studying payment competition issues.[89] In January 2007, the Polish competition authority banned interchange fees on cards.[90] In December 2007 European Commission decided to prohibit Mastercard from using multilateral interchange fees.[91]

Banks merge to form multinational financial service providers. Clearing centres consolidate into multi-country centres. Global standards and conventions replace outdated national solutions. Competition authorities need to cooperate in order to have a common stance on these developments; otherwise there could be regulatory arbitrage. International rules, standards, conventions and processing can provide benefits to the whole society.

Most of the network industries and also the payment industry have relied until recently on inter-service-provider infrastructures based on public services or private services functioning as cost sharing utilities. Today, more and more of these infrastructures are privatised and have become public companies. These continue to provide infrastructure services as a monopoly or in a limited competition setup with dominant players, for example a duopoly. It is a challenge for the authorities to maintain sufficient competition in such markets and to control the service provision of dominant private infrastructure

[86] H.M. Treasury (2000a) and (2000b).
[87] See www.rba.gov.au/PaymentsSystem/
[88] European Commission (2006a) and (2007a).
[89] OECD (2006).
[90] Office of Competition and Consumer Protection in Poland (2007).
[91] European Commission (2007b).

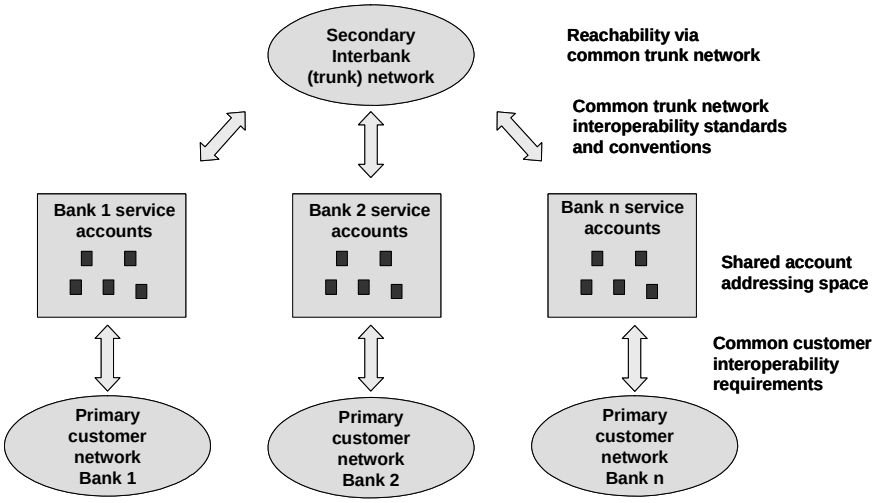
players, in order to reduce the possibility of extra gains and super-normal profits due to a dominant market position.

Payments are a typical network industry service, which would not function without agreements among service providers on the processing of inter-service-provider transactions. Almost without exception, a payment is made from one customer to another, usually with accounts in different banks. Agreements are needed on interfacing standards, data content, processing times, cover transfers, responsibilities etc, in order for interbank payments to be processed.

In the traditional (non-network) industries, the customers can buy the services from any of the service providers and the service providers are not dependent on each other or other customers. In network industries, the size of the common network is decisive, because the value of the network to the customers increases with the number of connections. The greater the number of telephones connected to the network, the greater the reach. An extensive reach is one of the main targets in any network. This results in a tendency towards a natural monopoly, because with competing non-interoperable networks, the largest network will be the most attractive to customers. In order to maintain competitive service providers in the same network, an inter-service provider network is needed to connect the customer networks of the different service providers. From this, it follows that interoperability between service providers is needed in network services. Compare this situation with mobile telephone networks without interoperability or a trunk network between the telephone companies. In the latter situation, the reach is poor and customers need several connections and handsets to satisfy their needs.

A functioning and competitive payment system requires the following common parts: an interbank trunk network and related interface standards and conventions, a shared addressing space for customer accounts and the interoperability required for customer services (see Figure 11.4). For example, in order to send a credit transfer from one customer to another, the addresses need to be known and unique; customers need to state the relevant data and banks need to send the transaction data to each other over the common interbank network, along with the cover. The data content that can be transferred between banks, and the content of the customer-to-bank network interoperability standards places limits on what can be sent end-to-end between customers.

Figure 11.4 **Common basic functions of competitive payment system**



A certain basic level of cooperation is therefore essential for the network industries, but excessive cooperation will reduce competition. There is a growing debate on what is excessive and competition-reducing cooperation, and competition authorities seem to be interested in increasing the competition in the payment industry. There seems also to be an interest in harmonising competition authority views on the regulatory support needed for sufficient competition in network industries, especially within the EU countries.

Such common network industry competition topics and their impacts are:

- common end-user standards, as these ease the switching of service providers
- transferable network addresses, as these also ease the switching of service providers
- transparent and comparable end-user pricing conventions together with restrictions on non-efficient bundling of services and abolishment of non-surcharge rules etc, as this promotes price competition
- interchange fee regulation or abolishment, to increase competition and price transparency
- restrictions on geographic or other segmented price discrimination in favour of service providers, to increase competition throughout the market

- opening of trunk networks to all serviced providers on an equal basis, to lower the barriers to new entrants
- common standards for trunk network interfaces among service providers, which promotes competition and mobility among parallel network operators when there is more than one trunk network operator
- separation of end-user service provision, network service provision and definition of network rules, conventions and standards (scheme management), to promote a level playing field among the different types of service providers and to minimize the area of non-competitive cooperation
- customer involvement possibilities in the development of user services and standards.

Network service providers have traditionally charged more for long-distance network services involving several service providers and for services to clients of other service providers. The customer options in such cases are usually limited and usage is infrequent. Service provision costs have been higher in physical transportation services as the distance increases, but digital communications, like Internet, have changed the cost situation completely. Charging more for cross-border payment services limits competition in the common markets. This was the basic reason for EU regulation 2560/2001, which states that cross-border and domestic payment charges levied by individual banks must be equal for all euro payments within the euro area. Corporate customers can now employ a small number of accounts in the SEPA area and can refrain from using national collection accounts and liquidity transfers among these accounts. Increasing competition by forbidding price discrimination (between high street banks and other banks) was also the reason for the Federal Reserve regulation of the 1930s stipulating the cheques have to be redeemed at par.[92] Large banks charging less for internal transfers or transfers to preferred partners create a cost barrier for other and especially smaller banks.

Network service providers can agree on an interchange fee when the service/transactions involve two service providers, usually one sending and one receiving service provider. Common interchange fees provide a minimum pricing level agreed among the competitors. All inter-service-provider transfers would include this cost component, which becomes a non-negotiable part of the service charges. In connection with payments, interchange fees normally transfer

[92] McAndrews (1998).

revenues from acquiring bank to issuing bank and hence increase payee/merchant fees. This reduces price transparency, as merchants are, by market conventions or contractual agreements, in a position in which these payment costs must be embedded in the prices of merchant goods. Banks have found increased interchange fees to be a convenient pricing method. Competition authorities meet the same kinds of problems in the roaming fees in mobile telephone networks. The Payment Service Directive (2007/64/EC) in practice abolishes the possibility of interchange fees for credit transfers, as it stipulates that the credit transfers should be transferred at full value and that the payer shall pay the charges of the payer's service provider and the payee shall pay the charges of the payee's service provider. Regarding card payments, Visa and Mastercard, under a special provision of the European Commission competition authority, have employed a multilateral interchange fee. The European Commission decided in December 2007 to withdraw the right of Mastercard to employ their current MIF in the EU for cross-border payments.[93] A change in the interchange fee convention could have a major impact on payment industry competition. The same types of policies have also been introduced in other network industries; eg in the summer of 2007 the cross-border roaming charges among mobile operators in EU were reduced by the EU Roaming Regulation (EC/717/2007) to what is called the 'Eurotariff', and further cuts are planned for 2008 and 2009.

Access to the interbank trunk network(s) is essential for service providers in order to provide payment services. In a payment system, these trunk connections are often provided in a tiered structure, with so-called clearing banks building the kernel interbank network and correspondent banks having connections to the network via clearing banks. This hierarchical structure was needed in paper-based processing with a large number of small regional banks. The access policy for central banks' payment and settlement services can also support tiered structures if access rights are limited to a smaller number of big clearing banks. However, in today's world of electronic networks, a tiered structure reduces competition compared to a flat one-level structure. In order to increase competition, all licensed service providers need to have open and equal access rights and possibilities regarding the trunk network, without special barriers favouring certain service providers.

Card payment services show competing 'branded' networks (eg Visa and Mastercard networks), which limit access to branded

[93] EU Commission (2007b).

transactions and participants. Competing networks have two sides: there is competition between the brands, but branding often entails barriers to switching among brands. Moreover, brands may impose other than basic interoperability requirements, and the closed networks of big established brands make it difficult for new non-branded entrants to establish the necessary interbank connections. One common open infrastructure is generally more efficient than two or more competing infrastructures, which will result in parallel and partly non-interoperable customer interfaces and reduced reachability.

One way to support competition between parallel trunk networks is to separate the network production service functions from the common interbank network rules. All interbank networks then follow the same rules and the service providers can use any of these. This is the current situation in the SEPA context in Europe, where EPC provides the basic payment schemes and interoperability requirements, but there is a large number of regional clearing houses and payment networks. In the US, NACHA (National Clearing House Association) acts as a body for establishing the interoperability rules, and the clearing houses and banks adhere to these rules.[94] The economies of scale and the benefits of network dominance tend, over the years, to consolidate parallel networks to one or two major networks.

The standards and conventions applied in the trunk network restrict the end-to-end customer services available between service providers. A very limited service between service providers enables particularly the large service providers to develop value-added services available only within their own customer service network, which attracts more customers to their services and reduces the interest of customers to use smaller competitors. For example, if intrabank transactions are much faster than interbank transactions, this encourages large payment receivers to bank mainly with large banks. Increased data content, like bank proprietary remittance data, proprietary e-invoicing or proprietary e-order services, creates sub-network structures within the main payment network, with negative competition effects. Open competition requires open standards also for advanced services.

As pointed out earlier, further efficiency benefits can mainly be found in customer interfaces and integration. Customers thus favour a wide range of common and open standards. Proprietary standards lock customers into one service provider. Proprietary standards also reduce

[94] See www.nacha.org.

the incentive of external software providers to build automated e-banking interfaces. The trunk network facilities limit the customer services possibilities. It is thus important that customers have a say and an impact on payment standards.

There has been a general convention of not surcharging cash payments at point of sale, as cash has been the dominant payment method. This also been the general case for cheques. There have been special regulations requiring free cheque redemption services (eg US and France). In order to promote card payments, several card schemes have implemented contractual non-surcharge rules. The non-surcharge rules require that the merchant embed the cost of the payment service in the prices of their goods in a non-transparent way. This reduces the pricing options of merchants. For other extra services, like parking and disposal bags, the merchant has the freedom to price as he chooses. Embedded charges also hide the costs from the customer, who cannot determine which options would reduce his costs. Pricing separately disposable bags enables consumers to economise on the bags. Transparent and separate pricing would, in the same way, promote the less costly payment instruments, increase price competition and reduce cross-subsidisation.

All network industries have to create an addressing space and allocate it in a unique way to the service providers, whether telephone numbers, card numbers or account numbers. This address ties the customer to one service provider if the address is absolute and non-portable. The tie is the stronger, the more costs or inconvenience is involved in changing the number. A customer receiving many calls from different persons finds it difficult to inform everyone of his new telephone number. The requirement for portable telephone numbers thus opened the mobile phone industry to a new dimension of competition. Portable account numbers can be found in the Scandinavia countries[95] for corporate customers, and the UPIC[96] account address in the US has the same functionality. Until now, portability of account numbers has concerned mainly the large corporate customers, as most other customers (consumers) receive only a limited number of payments. However, the increased use of direct debits and, in future, e-invoices will increase the number of transactions addressed to private persons. The competition impact of portable account numbers will therefore increase in future. Account number portability would make account management easier for both

[95] See eg www.bgc.se and www.bbs.no.
[96] Universal Payment Identification Code see for details www.theclearinghouse.org.

users and banks, because all obligatory changes could be automated, compared to the current situations in which these have to be done manually in a large number of systems.

Bundling of services is a difficult price transparency issue and can have positive and negative effects. Customers benefit when it reduces the total charges, simplifies the charging methods and makes price comparisons easier. Bundling is a negative factor when it ties customers to one service provider and hinders shopping around for the best offers. It is also negative when it requires accepting a larger offer than is needed. For example, merchants can be forced to accept both debit cards and credit cards at a common merchant fee instead of just debit cards at a lower merchant fee. Bundling credits with payment functions also means increased cross-subsidisation, as other customers and services will have to cover the credit costs when these are not separately priced. Payment services are often dependent on an underlying deposit or credit account and payments are therefore only a part of the banking services offered to customers.

Compared to other industries, payment services have been in an almost unique competition situation due to the public provision of cash services and its status as legal tender. It is the ultimate benchmark for all other payment instruments, which must provide some clear benefits over cash. Technically, and based on real costs, this has become easier as the efficiency of electronic account paymens have increased rapidly. Cash processes have also improved but to a lesser extent. The role of cash as an efficiency benchmark will therefore fade away even more in the future. This is also one reason for increased competition authority attention to the competing instruments. A public electronic payment instrument might become the same kind of benchmark in the modern e-world as was cash in the paper world.

As seen from this lengthy list of topics, network services in general and payment services in particular are a difficult area for competition authorities. Electronic developments and the increased use and privatisation of these services require more focus and new solutions in order to promote competition.

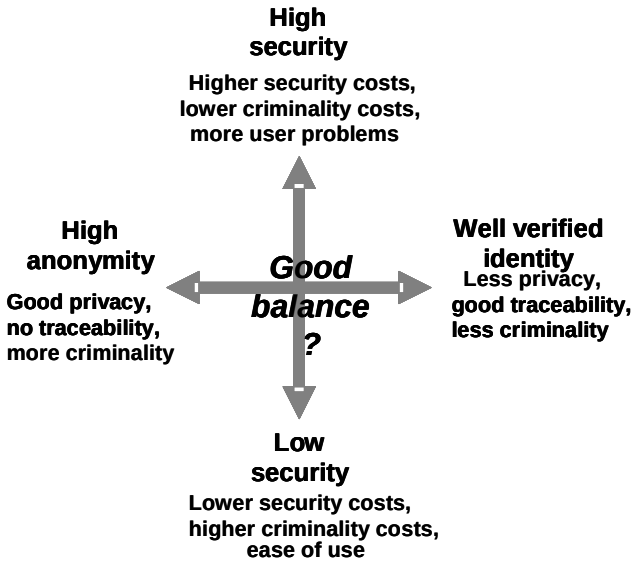
11.5 Data security, e-identity, privacy and criminality issues

The EU directive on the protection of individuals with regard to the processing of personal data and on the free movement of such data

(95/46/EC) establishes a high level of privacy for personal data. Personal data should be processed fairly and lawfully, for the relevant limited purposes, adequately and accurately, and not kept longer than necessary and in accordance with the data subject's rights. For all types of payments, it is important that the integrity , confidentiality and non-repudiability of the content is assured and that here is reliable user authentication.

The main issue in data protection and payment security is to find a good balance between security and privacy (Figure 11.5). Both need to be adequate. However, too much security will increase costs and reduce convenience, and too much privacy will result in too much abuse of the system. The user of funds needs to be identified securely in order to protect the funds. However, if the identity of the payer and the payment details are spread too widely the payer's privacy will be jeopardised. The problems of money laundry, tax evasion and transfer of illegal funds are growing.[97] Good traceability increases the possibility to uncover 'criminal' payments.

Figure 11.5 **Striking a balance between security and privacy**



[97] Quirk (1997), Lo (2002).

In the area of data security, e-identity, privacy and payment criminality, the main concern will be to cope with the increasing electronification and globalisation. Internet is a community without borders and the conventions of the paper world need to be transformed to the new electronic conventions and services in a secure way. Due to the openness of Internet, containing e-crimes will require new methods and international cooperation. As cash is mainly an efficient instrument for low-value payments and is more and more being replaced by more efficient e-payments, the remaining high-value notes will be increasingly used for criminal purposes. There are studies done by the Nordic central banks showing that about 50–60% of the cash stock is used for purposes that cannot be accounted for by normal business usage.[98]

The increased volumes of electronic data available in different databases provide new possibilities for data mining and criminal abuse. Enormous volumes of information on private and corporate customers reside in payment databases and these volumes increase with the expanding data content and volume of account-based payments. Customer privacy therefore requires increased protection in order to avoid abuse of this information. Payment information needs to be encrypted in order to reduce the possibilities of unauthorised access and/or data content modifications. Access rights and possibilities need to be strictly limited and controlled. One issue is the access rights of authorities to payment information, which is topical due to the SWIFT case under discussion.[99] The main questions in this debate are; which authorities may with which mandates request what kind of data that is generally protected by the banking privacy.

The openness of Internet has it drawbacks in increasing the problems of viruses, spyware, garbage mail and unauthorised usage. If these cannot be better controlled in the future, electronic commerce and electronic business in general will be hampered, for both the private and public sectors. Payments need a secure and trustable environment. If private solutions are not forthcoming, public regulations may be necessary, which then will limit the openness of Internet. As Internet traffic grows and becomes more and more important for the society, interest in protecting this traffic will also

[98] Humphrey et al (2000), Martinson and Guibourg (2001), Paunonen and Jyrkonen (2002).

[99] SWIFT Affair: Europena Data Protection Authorities joining efforts; see (http:/ec.europa.eu/justice_home/fsj/privacy/news/docs/PR_Swift_Affair_28_07_06_en.pdf) and www.swift.com on whether SWIFT has the right to provide information on EU payments to US authorities.

grow. The situation can perhaps be compared to road traffic and its regulation, which, with growing traffic and traffic accidents, has resulted in more and more detailed regulations in order to reduce accidents etc.

In the paper world, public authorities provide different kinds of identity paper (ID cards, drivers licenses, passports etc). However, similar things for the electronic world are available in very few countries and often only on a trail basis. The Finnish HST (Henkilön Sähköinen Tunnistaminen) project[100] provides a chip-card based e-identity solution for Finnish citizens, but usage is still quite limited. Public key infrastructure[101] is the current state-of-the-art solution for e-identification and e-signature. PKI relies on the certificate authority (CA) function, which administrates the public key directory, issues and manages the security credentials, verifies the original identity of persons/institutions and confirms the identity of persons/institutions in their registers to third parties. CAs must be trusted institutions with very high security standards for their systems and verification of their customers. In order to support the necessary international reach, the CAs need to form an international network via which international customers can be electronically introduced to each other in a secure way. The Porvoo group[102] is an initiative of this type. Implementing PKI will also require secure devices at customers to store the private keys with protection against fraudulent use (see section 8.8). If public authorities were to take the same role in electronic identification as they have in paper-based identification, they would provide a public PKI solution with e-identities for all citizens. An efficient public e-identification service would be able to replace the different private electronic identification systems. A single e-identification mechanism would suffice, as banks etc could always look up the customer data and services in their systems based on the official e-identity.

E-identities could also be supplied by private institutions. They would also need to form an international network in order to establish the sufficient reach. Such a network will be as week as its weakest link. If one of the network participants has lower security standards than the others, the security level of the whole network will be reduced to that level. For example, if one participating CA verifies the original identities of its customers with less accuracy, there will be is a big risk of forged e-identities. If the issuing of e-identities is a private business, it will require some level of authority control in order to

[100] www.vaestorikisterikeskus.fi/vrk/home.nsf/www/electroicidentity and www.fineid.fi.
[101] See for details Schneier (1996) and www.wikipedia.com.
[102] See www.fineid.fi and www.porvoo12.net.

ensure sufficiently high security standards. The quality of an identification system relies partly on the technology employed, but to a large extent on how well the true identity of the persons are checked once the e-identity is established. High-quality e-identification systems required high standards for identity checks, eg by the police force. The same technology can be used for different e-identity qualities, and parallel use of different quality levels might be an efficient solution since customer and business needs vary.

Banks already employ different kinds of e-identification methods in e-banking, and they have created an interbank network of trust. And banks are supervised institutions. Banks are therefore in a position to provide secure e-identification services. Such service has emerged in Finland[103], where banks provide a secure gateway via the e-banking service to other service providers, eg the e-services of insurance companies. The bank-provided e-identity can thus be reused by other service providers.

The magnetic stripe card with PIN has traditionally been the customer identification means for selfservice point of sale terminals and ATMs. It will soon be replaced by EMV chip cards[104] in the SEPA region and in other regions. This is a typical example of the need to enhance security features, as criminals learn to copy mg-stripes and collect PIN information on these cards. There would be synergies in merging the different identification methods and using the same 'card' for several identification situations. With the growing use of mobile phones it could become the SIM-card[105] of the phone, but this woulc require cooperation among all stakeholders.

An account-based transaction always leaves an audit-trail. The payer and payee account in an account-based transaction can always be traced. Complete anonymity for account-based transactions can only be provided via 'numbered' accounts without any attached customer identification information. Most countries have a clear policy or regulation stating that bank accounts cannot be anonymous. But banks should know their customers. Anonymous accounts are seen as for a tool of different kinds of criminal abuse. The anonymity of account-based payments could be adjusted in different ways so that in most cases an account would appear to outsiders as a 'numbered'

[103] TUPAS, Banks' Tupas Certification Service, in which banks identify the customer using bank identifiers and certify the customer's identity to other web-service providers in a secure way (for details see www.fkl.fi)
[104] See for details www.emvco.com.
[105] Subscirber Identity Module, which is the chip-card in the mobile phone; for details, see www.wikipedia.com.

account, and the true identity would only be revealed as needed to a very limited number of authorities. Cash is a completely anonymous payment instrument, which explains its popularity among criminals. However, there are also non-criminal payment situations in which citizens would want to ensure a high level of anonymity.

Future e-crimes will likely involve forged card information used on Internet, stolen or forged e-identities, abuse of payment data or stolen funds from e-payment accounts via e-banking or mobile connections. Criminals will learn how to attack e-payment systems. Criminals will use all means of hiding in the e-jungle of Internet, eg anonymous servers in regulatory heaven countries. In order to shut out criminals it is as important to be able to track them down after the criminal acts as it is to protect the funds and hinder criminal acts in the first place. There will therefore be a growing need for tracing the sources of Internet attacks and reducing the possibilities to profit on values extracted in a criminal manner. This will require rapid action by both the banks and the police force, as Internet functions virtually in real-time and criminal activities can be pursued very rapidly. It will also require extensive international cooperation, because the attacks will most likely be channelled via servers in many countries.

DNA has proved to be an efficient way to identify criminals in traditional crimes, where the criminal has been physically present at the crime scene. In the e-world, criminals will be only remotely present, so there is a need to increase traceability in the e-world in order to be able to solve e-crimes.

The authorities' stances and services in the area of e-identification, privacy and data protection will probably have a large impact on future payment services. Authority interventions can either accelerate or retard developments towards e-payments. It is important that public authorities publicise their long-term views and objectives, so that these can be incorporated in future payment system designs.

11.6 Operational public payment services

Central banks have generally been involved in several operational payment services for the general public and for financial institutions. The main public services in the area of payments have been

- issuing and distributing cash (and future possibility for e-cash)
- retail payment services for the public and for government agencies
- clearing services for retail payments

– large value payment transfer services
– interbank and ancillary system cover-transfer services.

In the provision of payment services, public service providers will face the same challenges as their private competitors. In order to be efficient and competitive, the public services need to employ modern ICT solutions. Until now, public services have mainly been provided only on the national level. The e-world and general globalisation will require more central bank cooperation and cross-border services. The TARGET2 system[106] is a good example of enlarged international central bank cooperation.

The use of traditional cash for normal payments is declining. The speed of the decrease would increase if cash were priced more transparently. Central banks receive large amounts of seignorage, especially on the high value notes.[107] This puts central banks in a difficult position, as actively promoting a shift to more efficient payment methods would reduce their own income.[108] However, for society as a whole, it would be beneficial to move to more efficient payment instruments, when the costs of cash processing are higher than those of more efficient instruments. Transparent pricing of the real cash costs would probably speed up the process. There is also an interesting development in some developing countries, where cash remittances are moving to mobile phone technology.[109] This development could create a new type of cash, which would function without ATMs and other traditional cash infrastructures.

Moving cash to the next generation of technology would imply an e-cash solution. The main feature of cash is that it is universally acceptable and is the legal tender. Cash is today mainly processed in a closed loop: the payer withdraws cash from an ATM, hands it over to the payee (merchant), who deposits in his bank. An electronic equivalent would be a network-based withdrawal of funds from the payer's bank account, temporary transformation (a split second for the transfer) to central bank money and a hand-over to the payee/merchant, who directly transforms it to a deposit in his bank. The merchant has no interest or benefit in delaying the transformation

[106] See www.ecb.int.
[107] Cash comprises bearer certificates for which the central bank does not pay any interest. This provides the central banks as the issuers, with an interest benefit called seignorage, when they invest these funds on the market. For example, if the interest free euro cash stock of about EUR 700 billion wereacquired by other means at an average rate of 3% pa, the comparative gain would be about EUR 21 billion.
[108] van Hove (2007).
[109] Vodaphone (2007).

via an interest bearing deposit. Public electronic cash would therefore be a central bank-specified technical process for the transfer of funds electronically from payer's account to payee's account. Central banks would stipulate the interfaces for the banks and the dialogue for the transfers (details in the previous chapter). In the paper world, central banks provided a universal payment instrument. In the e-world, the analogue would be a universal e-payment interface.

Some central banks provide retail payment and payment account services to other public institutions or to the public at large. Providing retail payment services in this context would also require providing payment accounts, from which the payments are made. Customers can also make cash payments in some central banks, which the central banks transform into credit transfers, but this is generally a very inefficient option compared to e-banking-based credit transfers. Providing retail payment services to citizens is largely a competition issue. Central banks can only use the same technology as the private competitors and have no competitive advantage in costs. If there is too little competition in the market, public provision could increase competition. However, if public services are provided at subsidised prices, public services will crowd out private competing and more efficient, solutions, and the subsidies would need to be collected from entities other than the users of the payment services. Heavy subsidisation would result in a monopoly situation with the normal drawbacks.

Some central banks provide clearing services for retail payments. These have generally been based on centralised clearing house services. In modern environments, the clearinghouses will be replaced by decentralised and distributed network structures, as discussed in previous chapters. The clearing house functions will change to network administration functions in a flat network, where all banks communicate directly with each other (see chapter 10 for details). Most clearing houses are in a monopoly position, and it would therefore be important that central bank-operated clearing houses would be among the first to benefit from modern technical possibilities, as central banks should have less interest in prolonging the use of legacy systems.

Until now, large value payment systems have generally been designed as separate systems. Large value payments are often urgent, and speed is essential. Special real-time systems have been designed for large value payments. Most central banks provide large value payment systems -often called RTGS (Real-Time Gross Settlement) systems. The bulk of payments, low value payments, are still processed in slow batch-type systems. However, the course of

development in ICT is towards processing all kinds of payment immediately in real-time, and real-time retail payment systems are emerging. There will not be any cost or technical reasons for differentiating between large value and retail payments. The same system can carry all kinds of payments, as the number of significant numbers in the amount field plays no role in a completely automated process.

The basic service of central banks for the financial markets is to serve as the bankers' bank. Central banks provide settlement accounts for financial institutions, so that settlement transfers can be made between them. Settlement transfers in the batch world moved in settlement cycles, where covers are formed for payment batches, often by netting the gross transfers into net positions. Active participants in cover transfers can be banks and clearing houses. The development towards immediate payment transfers will also require that settlement is immediate, in order to reduce settlement risks by providing real-time settlement as part of the payment transfer.

The operational services will also be affected by globalisation. The Eurosystem large value and interbank cover transfer service, the previous TARGET1 version, and new TARGET2 version are good examples of international central bank cooperation. However, the financial markets are already truly global, and central banks will need to cooperate more in future regarding standards, cross-border services and access policies, in order to provide services in line with market needs. One access policy issue for competition effects is access to central banks' settlement accounts. A strict access policy favours tired system structures, while an open policy would support increased competition and development towards the flat structures of the e-world.

11.7 Summary of authority involvement

Central banks' oversight function in payment systems is particularly important in times of change. Payment system risks will change, so that risk management methods need to be updated. Central bank input is also needed to speed up developments, as the payment industry often has an internal interest in delaying developments in order to prolong the use of legacy systems. Common international oversight requirements and cooperation among central banks will be needed as national payment systems will consolidate into multi-country or global

infrastructures and both technical and institutional interdependencies will increase.

Financial supervisors will see increased international consolidation of traditional financial institutions, but also a series of new global payment service providers operating from foreign countries. Supervision will in future require intense cross-border cooperation and possibly even international supervisors.

Regarding consumer protection, the main issues relates to consumer e-readiness and e-exclusion. E-services will require more know-how, and the international Internet risks should be noted. Some individuals will have difficulties in acquiring sufficient e-readiness, and this might result in economic exclusion if e-payments become crucial for normal business.

Payment services is a network service with long traditions in paper processing, which entails several competition-reducing factors, eg hidden pricing, interchange fees, cross-subsidisation and monopoly institutions/networks. However, cooperation is crucial among payment service providers in order to provide reachability and interoperability in the payment network. Competition authorities need to promote a new kind of balance between cooperation and competition which is suitable for the new ICT environment and the global markets for payments.

Funds and payments will always attract criminals, and e-payments will tempt e-criminals who have learnt to circumvent the locks and barriers in electronic environments. The protection against criminal abuse must be updated continuously and new methods are needed in the e-environment. Modern ICT offers the possibility of very high traceability and, as payment traceability is an important protective measure, a suitable balance is needed, in which law biding citizens have sufficient privacy and protection but at the same time criminals are not given too much room for untraceable activities.

Central banks in particular have traditionally provided operational payment services especially for financial institutions but also in some degree directly to citizens. Traditional cash services will decline and a central issue becomes whether a modern equivalent in the form of e-cash is needed. Will the private sector provide sufficiently efficient electronic payment solutions or will there be a need for a competing public electronic payment instrument? Retail and large-value payment systems will probably merge in future due to a common technology base. The central bank service for interbank settlement will need to be updated in accord with the needs of immediate distributed network-based settlement of individual payments in real-time.

The speed of development in the market and in IC technology will be rapid and public authorities need to match this development speed, which may conflict with their traditional conservatism.

12 Conclusions and recommendations

Based on this study, there would seem to be a huge potential for increasing the efficiency of payment systems by implementing new technologies. But in order to speed up the development process, the institutional structures and setups need to be changed and the incentive for development needs to be increased. The findings of this project indicate that the following actions would be the most beneficial:

1) Developing an open, modular and general process-to-process payment dialogue and a single common global message standard for all payment types with the possibility to attach the necessary data directly or as separate enclosures

   Emails offer a general and suitable structure for message processing, which could accommodate payments by adding the amount to be transferred. Basically all payments have the same data content, which can be described in a general XML scheme. The same standardised scheme could be used globally and for different currencies, as a currency can always be defined by a currency code. In real-time, the most efficient payment instrument will be the credit transfer, which can be initiated using payee data, but always accepted by the payer.

2) Designing an easy-to-use payment interface for mobile telephones including the consumer-to-point-of-sale, consumer-to-vending machine, consumer-to-ticketing machine and consumer-to-consumer applications

   Mobile phones have all the necessary features to become our main payment interface for retail payments. However, there must be a very secure environment, and the service providers should make it viable for large volumes of small payments. Although completely digitalised, the user interface with mobile telephone screen should be such that the users can easily control their payments and balances.

3) Developing a general customer identification and data encryption service for use in open network environments

   Customer identification will be one of the big challenges in the open network environment. There is a need for a common structure and organisation of interoperable network service providers. This issue would require more attention than it has received thus far.

4) Setting the e-invoicing and e-ordering standards

   E-invoicing and e-ordering, with standardisation and common implementation, can generate large cost savings. There are clear synergy effects in expanding payment data with enclosed e-invoicing and e-ordering data, which will in the end produced easily ‘browsable’ e-archives of e-invoices.

5) Introducing transparent end-user pricing and abolishing different kinds of hidden pricing conventions and cross-subsidisation

   One of the biggest barriers to the changing of payment is hidden pricing, which is common for all payment instruments. As long as end-users cannot see the costs of paying, they have little incentive to change their behaviour to more cost efficient payment methods.

6) Analysing which competition-increasing solutions would be necessary in the payment industry

   Payment services comprise a network industry that has, over the years, developed into a very non-competitive industry. There are several possibilities for opening up payment services to competition, and we need to identify the most efficient ones. Because all network industries face the same kinds of competition problems, the competition issues could probably be best solved by introducing the same sorts of competition-promoting policies for all of these industries.

7) Increasing customer involvement in payment service developments in order to increase efficient integration

   The main benefits can be achieved in future via efficient bank-to-customer integration. The main savings can be made in

customers' payment systems and processes. Customers should be more involved so as to increase banks' understanding of customer needs.

8) Developing interbank clearing and settlement conventions suitable for a real-time and transaction-based network environment with immediate transfer and settlement

   Every payment needs to be transferred from sending bank to receiving bank, and a modern distributed payment network would be the most efficient solution. Costs of transporting transfers could be brought down to the level of transporting emails. In addition to being transported, payments must also be covered by a settlement among the service providers. There is a need for developing a new immediate transaction-based settlement convention suitable for the new real-time network environment. Payments must become final immediately.

9) Analysing the benefits of developing a new completely digitalised real-time network-based payment convention without the legacy burdens of current offerings

   Current payment systems have a large legacy burden from the paper and batch processing era, which delay developments towards real-time solutions and make a gradual evolution within the old infrastructure quite costly. The new IC technology and workflow processing is based on major changes in the whole design of IC systems and their interfaces. The user interfaces and processing patterns will also change when payment systems provide real-time finality, confirmations and error processing. The situation could be compared to the changes in logistics with just-in-time container transports for goods for which major new investments in logistics, ordering systems, vessel, port and road transportation equipment designs were needed. The old and new infrastructures could work in parallel, and even with some common parts, but the design of the new payment system would be based on the long-term future needs without carrying over inefficient old conventions. The current legacy services will not be suitable for the coming real-time economy. The new systems would become more efficient and implementation via parallel usage would be easier to manage.

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