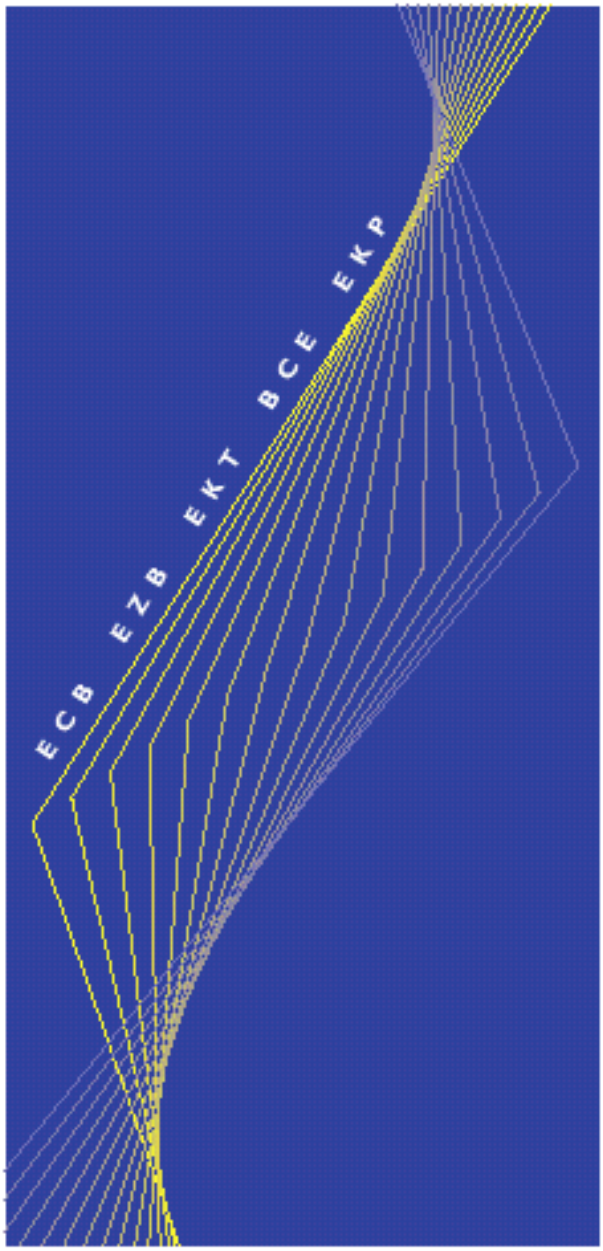
EUROPEAN CENTRAL BANK



THE EFFECTS OF TECHNOLOGY ON THE EU BANKING SYSTEMS

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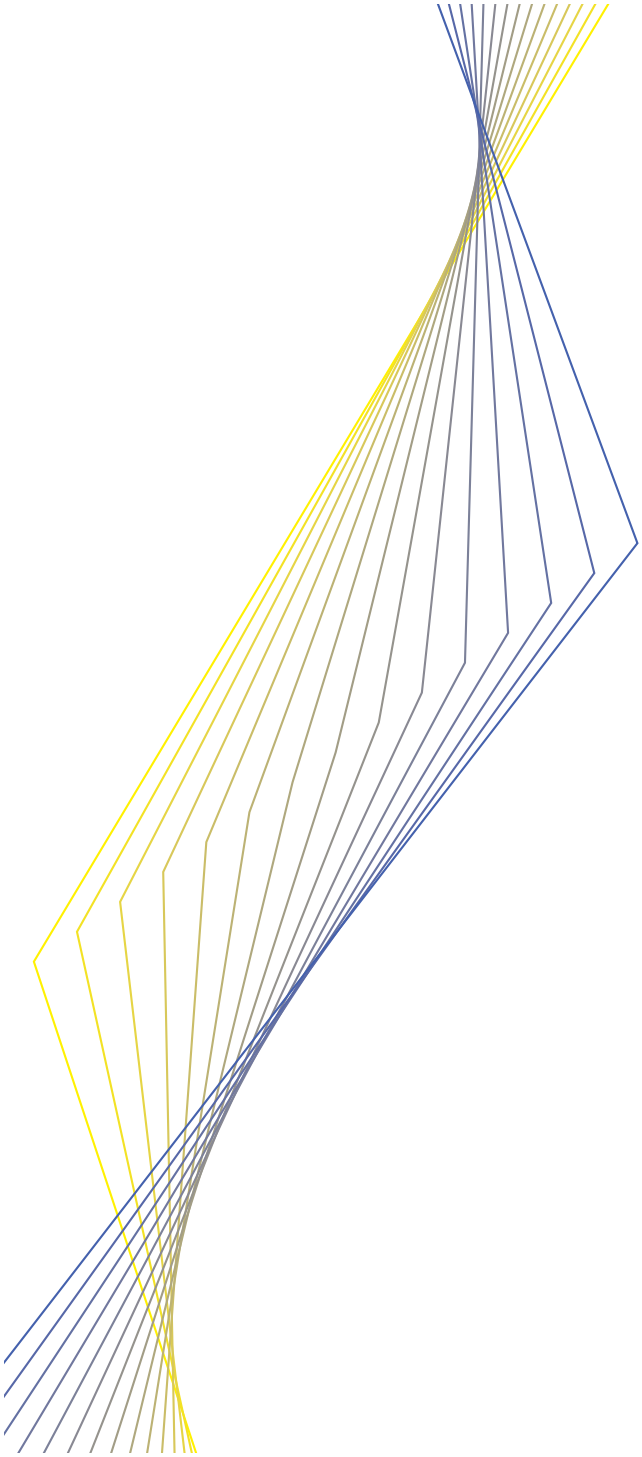

THE EFFECTS OF TECHNOLOGY ON THE EU BANKING SYSTEMS

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ABBREVIATIONS

BE	Belgium
DK	Denmark
DE	Germany
GR	Greece
ES	Spain
FR	France
IE	Ireland
IT	Italy
LU	Luxembourg
NL	Netherlands
AT	Austria
PT	Portugal
FI	Finland
SE	Sweden
UK	United Kingdom

In accordance with Community practice, the EU countries are listed using the alphabetical order of the country names in the national languages.

Executive summary

The developments in information collection, storage, processing, transmission and distribution technologies have influenced and continue to influence all aspects of banking activity. The present report – prepared by the Banking Supervision Committee of the European System of Central Banks (ESCB) – describes the extent to which these developments have taken place in the European Union (EU) and investigates banks' strategic adaptation and risks related to technological progress as well as relevant supervisory issues.

Information technology (IT) developments affect banking in two main ways. First, they contribute to the reduction of the costs associated with the management of information (collection, storage, processing and transmission) by replacing paper-based and labour-intensive methods with automated processes. Second, they modify the ways in which customers have access to banks' services and products, mainly through automated channels ("remote banking"). Whereas improvements in the area of information management have been taking place for a long time, remote banking is a more recent phenomenon with developments occurring more progressively, especially in retail banking.

Remote banking is currently offered by at least all major banks throughout the EU. Most of the standard retail banking services are already offered via automated teller machines (ATMs) and telephone banking. Variation across countries is substantial, however, with regard to the specific "models" of remote banking and customer acceptance. Online PC banking and Internet banking are generally not yet widespread, although most major banks have established Web sites for information purposes. In the future, however, Internet banking is expected to have the highest growth potential, incorporating increasingly sophisticated products. The use of electronic money (e-money) has taken off more slowly than might have been expected. The main reasons for this are slow acceptance by merchants, obstacles presented by cost, security concerns, the lack of cross-border compatibility and the incompleteness of the regulatory framework. Nonetheless, the use of e-money might gain momentum once a certain "critical mass" has been reached.

As the majority of banks have no direct influence on technological developments, their main objective is to adapt to the use of the new technologies in their production and distribution processes. In this respect, it should be noted that technological developments offer banks major business opportunities as follows:

- the cost per transaction can be significantly reduced; estimates of the costs of various remote banking transactions range from 1-25% (Internet banking) to 40-71% (telephone banking) of the cost of the transactions handled manually. Banks themselves expect the largest cost reductions in retail securities and payment business. However, for a number of reasons there seems to be uncertainty among banks about the actual extent of future overall cost reductions and profitability increases. Customers' acceptance of new banking

technologies is uncertain and may evolve rather slowly, investment costs in modern hardware and software are high, and these costs recur when new versions need to be installed. In addition, average labour costs may increase owing to the need for generally more highly qualified staff;

- new, principally world-wide marketing and transaction instruments are available to increase the market share;
- more efficient means are available to process information related to the needs and habits of customers;
- possibilities of diversifying into new business areas (such as electronic commerce and non-financial services) and of becoming "service aggregators" are increased; and
- improved tools are introduced for banks' internal information management and risk control.

At the same time, banks face a number of strategic challenges when confronted with technological developments. These are as follows:

- remote banking may turn from a supplementary to a core service in the medium to long term. Hence, a failure to enter into this area successfully may have severe consequences for the future market position of individual banks;
- customer loyalty may decrease since customers have enhanced access to competing suppliers of financial services and increased information on the prices of banking services and products. In the latter respect, specialised "information brokers" might emerge to assist customers in their information search. However, although there are signs that customers are starting to "cherry-pick", a significant decline in customer loyalty cannot yet be observed. Moreover, the importance of relationship banking should not be underestimated even in the case of remote channels; and
- competition within the banking sector and from non-bank financial institutions (security brokers, funds and supermarket chains) may intensify significantly with the development of remote banking.

Technological developments based on remote banking can potentially determine substantial changes in the nature of banking competition for two main reasons. First, on the demand side, customers have the possibility of more easily accessing and obtaining information on banking products and services offered by different banks and, hence, of making comparisons. Second, on the supply side, the barriers to entry into the retail market are lowered since a large branch network is no longer necessary to reach a "critical mass" of customers. This means that small banks and "niche" institutions can also become competitive in the area.

Against the background of the strategic opportunities and challenges, it should be noted that banks within the EU currently use IT resources mainly to manage pressing operational needs such as adaptation to the euro, the Year 2000 problem and the revision of risk management models. Only a few banks have chosen to become "banking technology leaders". EU banks are expected to continue to exploit IT resources to further improve the internal information management process, but, depending on the increase of customer acceptance, they are also expected to broaden the use of remote banking (in particular telephone and PC banking). This could have the following consequences for banks:

- increased pressure to reduce the number of branches in order to achieve a viable balance between physical and remote distribution channels;
- a change in the overall profile of bank staff in favour of marketing, IT and more sophisticated and value-added services;
- intensified outsourcing of IT-related activities;
- increased emergence of strategic alliances and co-operation agreements between banks on the production (e.g. development of common standards, sharing of development costs, processing of payments) and distribution side (e.g. compatible ATMs, universal debit card schemes) in order to achieve efficiency gains and offer customer benefits through widely acceptable payment means;
- increased strategic alliances and joint ventures between banks and IT companies and telecommunications operators to allow the effective application of the most up-to-date IT and to optimise research, development and implementation costs; and
- increased competition within the banking sector.

IT developments affect the overall risk profile of banks. Some banking risks are heightened, whereas others are reduced. Strategic, legal and operational risks deserve particular attention. Given the speed which characterises technological developments, banks run the risk of investing in IT resources that could quickly become outdated or of devoting excessive resources to the launch of new products without careful analysis of demand and level of acceptance. Legal risk is linked to the uncertainty surrounding the applicable laws and regulations on a number of aspects relating to technology (e.g. the legal status of remote banking, validity and proof of transactions, the respect of customers' privacy). Operational risk can increase with technological developments to the extent that banks do not upgrade their systems of internal control to cope with the new operational environment. Finally, the possibility of systemic risk may increase since technology increasingly links banks to each other through alliances and joint ventures, standardisation and the possible use of similar soft and hardware.

Technological developments in banking also have important implications for prudential regulation and supervision. In the area of prudential regulation, the reduction of legal risks might be

favoured by the adoption of the necessary legislation (e.g. on electronic signatures), whereas operational risk might be addressed through the identification of appropriate standards. In this context, reference should also be made to the need to enhance the information at the disposal of the public about the opportunities and risks related to the use of IT in banking. With particular regard to Internet banking, it is important for customers to be able to recognise which financial service providers are properly supervised. As to prudential supervision, increasing attention is being paid by banking supervisors to issues stemming from IT developments in banking, although the specific types of action taken vary from one country to another. In general, given the speed and complexity of technological developments, banking supervisors are confronted with the need to enhance their knowledge, technical skills and tools in this specific field.

Introduction

One of the tasks of the European System of Central Banks (ESCB) – which comprises the European Central Bank (ECB) and the 15 national central banks (NCBs) of the EU Member States – is to *"contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system"* (Article 105 (5) of the Treaty establishing the European Community). In this context, a relevant contribution is the monitoring and analysis of the major developments in the EU banking systems, which may have an impact on their stability. The Banking Supervision Committee established by the Governing Council of the ECB assists the ESCB in carrying out this activity. The Committee is composed of the representatives of the NCBs and – insofar as central banks are not in charge of banking supervision – of the national supervisory authorities of all 15 EU countries and the ECB. In addition to this report, the Committee also prepared a report on *"Possible effects of EMU on the EU banking systems in the medium to long term"*, which was published in February 1999.

Information technology (IT) developments have an effect on practically all aspects of banking and can be regarded as one of the main driving forces for change in the banking sector, not only in the EU but also globally. In particular, IT influences banking in two principal ways.

First, IT developments lower the costs of banks' information collection, storage, processing and transmission operations by substituting computers for paper-based and labour-intensive methods of accounting for customer transactions and banks' internal operations. This first *"internal wave"* of technological change started as early as the 1960s and 1970s. As banking is a very information-intensive business, the cost savings have already been considerable and there have been significant implications for the banking structure, e.g. through the centralisation and outsourcing of the related functions.

Second, IT developments offer the possibility of altering the ways in which customers gain access to banking services. This second *"external wave"* of technological development, whereby customers are increasingly serviced through automated channels without direct contact with bank personnel, has intensified more recently. The displacement of the service traditionally provided at branches is referred to as *remote banking*. The first developments took place in wholesale banking (such as the abandonment of face-to-face securities trading), spreading subsequently into retail banking as well. The diffusion of electronic money (e-money) and electronic commerce (e-commerce) in the Internet is a special aspect of this development. These newer developments can further reduce banks' costs, but also have important effects on banking structure and can change the competitive environment of banks substantially in the years to come.

The improvements in banks' internal information management are likely to continue. As regards new services and distribution channels, pressure for future change seems particularly intense in retail banking, due to the evolution of remote banking in this field. In the wholesale area as well, new financial products, product refinements and new combinations (e.g. derivatives) are constantly evolving.

This report is divided into five sections. *Section 1* gives an overview of the extent to which remote banking has so far been adopted in retail banking and the banking services which have been involved in this development. Some likely trends in the short to medium term are also identified. The use of electronic payment instruments and the spreading of e-money are investigated in more detail, as payment transmission constitutes an integral part of retail banking services. The scope of the rest of the report is widened in order to investigate the incorporation of technological development into banks' strategies and to analyse the risks involved in a more comprehensive manner. *Section 2* examines, first, the cost and revenue-related strategic motives of banks to invest in new banking technologies. On the basis of banks' possible strategic responses, a number of potential effects on the structure of the banking industry are identified. *Section 3* assesses the effects of technology on risks in banking, and *Section 4* discusses the issues related to banking supervision. The relations between banking supervisors and the overseers of the payment system and the specific issues falling within the latter authorities' competence are not covered in this report. This means, inter alia, that important developments in large-value interbank payment systems with regard to their efficiency and inherent risks are not addressed. The last *Section* provides conclusions.

The report is mainly based on contributions by the EU banking supervisory bodies and includes the outcome of interviews with selected banks and other financial institutions. Figures presented in this report should be viewed with caution, since they have not always been collected on a fully harmonised basis or may refer to somewhat different points in time for different countries.

1 Remote retail banking: its nature and acceptance

Remote banking refers to the provision of banking services without face-to-face contact between the bank employee and the customer.[1] The key feature is that remote banking services represent complementary or even substitute services for those traditionally provided at branch offices. The following types of service fall within the scope of remote banking defined in this manner:

- *kiosk (or self-)banking,* where the customer uses multi-purpose ATMs installed by the bank which may also use an interactive television to link the customer to a bank clerk in case guidance is needed;
- *telephone banking*, where the telephone is used as a message carrier to enable person-to-person or tone or voice-activated communication between the bank and the customer; and
- *PC banking*, where a telephone network or the Internet is used as a data-message carrier and the customer uses a PC and a modem and is either given some *home banking* software by the bank (*online PC banking*) or uses software directly available on the Internet (*Internet banking*).

1.1 Banks' involvement in remote banking

According to the information obtained from the EU banking supervisory authorities, remote banking is currently offered by at least all major banks as well as niche banks throughout the EU as a part of an overall distribution strategy. Remote banking is already often regarded as a part of the basic retail banking service. Remote banking seems, at present, to be mainly offered via parent credit institutions that tend to be major domestic institutions. So far, not many banks concentrate exclusively on remote banking channels, although in principle, a bank using remote banking distribution methods can operate even without branches by being accessible as a *"virtual bank"* on the Internet or via the telephone or the ATM network. The existing "pure" remote banks usually belong to banking groups. These banks mainly focus on deposit, securities and investment business. Overall, the total assets of these banks constitute a negligible part of total banking assets. There are a few examples (from Belgium, France, Ireland, Italy and Sweden) of traditional banks creating remote bank subsidiaries which develop their own corporate identity and provide retail banking services at a lower cost than the established banks.

In sum, the following pattern of banks' involvement in remote banking can be observed in the EU:

[1] *"Home banking"* is a part of remote banking. In its Glossary, the ECB publication entitled *"Payment systems in the European Union – Addendum incorporating 1997 figures"*, January 1999 (hereinafter referred to as *"Payment Systems in the EU"*) defines *"home banking services"* as services which a retail customer of a financial institution can access using a telephone, television set, terminal or personal computer as a telecommunications link to the institution's computer centre.

- major institutions offer "traditional" remote banking services (kiosk and telephone banking) and have started to offer a growing number of online PC banking and Internet banking services;
- some small-sized specialised banks operate without branches exclusively via remote banking channels. In most cases these banks are subsidiaries of existing banking groups; and
- innovative new institutions are setting up business on the Internet, also covering traditional banking activities. This activity is often promoted by large to medium-sized banks.

The information supplied by EU banking supervisors implies that the intensity with which banks have promoted various remote banking "models" differs significantly from one country to another. If large investments have been made using a particular "model" (such as telephone banking, see Box 1), these investments may slow down the adoption by banks of newer "models" of remote banking (such as Internet banking). The emphasis on a particular "model" is also dependent on the telecommunications infrastructure and other such conditions in a particular country.

Box 1

The experience of Minitel in France

Minitel is a videotext service combining the use of the telephone network and relatively cheap terminals which provide access to thousands of online services. Minitel was introduced more than 15 years ago by France Télécom (at that time a monopolist). In the beginning, Minitel received strong commercial support, as terminals were distributed free of charge. At present, the price of a terminal is still considerably lower than that of a PC. Some 6.5 million Minitel terminals, plus 1 million Minitel PC emulations, are used in France. Minitel is used by 10% of retail banking customers and can be used for account consultations, money transfers and securities transactions. Even though Minitel may be viewed as having been an obstacle to the development and use of Internet services in the past, it is believed that the Internet is set to expand rapidly in the years to come due to the availability of more advanced options and the experience that the French have of online services provided through Minitel.

1.2 Penetration of remote banking services and channels

Until now, major emphasis has been placed on developing ATM and telephone-based services, while PC banking has generally only started to develop more recently.[2] In principle, many, if not most, standardised retail banking services can be promoted via remote channels. At present, the main focus is on submitting account balance information, providing money transmission services and securities transactions, collecting loan applications and providing information in general. The more sophisticated services are still mainly provided on a face-to-face basis or by direct contact by telephone. Table 1 provides an overview of products which are already offered via remote

[2] Finland represents a significant exception, as already 15% of banks' private customers were using online PC or Internet banking services in mid-1998. The corresponding figure was only 1% in 1995. The United Kingdom and Sweden also reported substantial recent increases in Internet banking activity.

channels in the EU. It is based on supervisors' responses and other supporting material. As the specific services can vary considerably from one country to another, the Table should be taken as providing a general indication only.

Table 1

Banking services offered via branches and remote channels

Channels / Services	Branches	Kiosk banking	Telephone banking (person to person)	Telephone banking (tone or voice-activated)	Online PC banking	Internet banking
Cash withdrawals	Yes	Yes	No	No	No	No
Loading of prepaid cards	No	Yes	Yes	Yes	Yes	Yes
Loading of network money	No	No	Not usually	Not usually	Yes	Yes
General information on bank products and market developments	Yes	Yes	Yes	Yes	Yes	Yes
Account balance information	Yes	Yes	Yes	Yes	Yes	Yes
Money transfers	Yes	Yes	Yes	Yes	Yes	Yes
Direct debits and standing orders	Yes	Yes	Yes	Yes	Yes	Yes
Credit and debit card requests	Yes	Yes	Yes	No	Yes	Yes
New cheque books orders	Yes	Yes	Yes	Yes	Yes	Yes
Investment advice	Yes	No	Yes	No	Yes (for standard products)	Yes (for standard products)
Securities transactions	Yes	No	Yes	No	Yes	Yes
Loans (standardised)	Yes	No	Yes [4]	No	Yes	Not yet
Deposit business	Yes [1) 2)]	Yes [1) 2)]	Yes [2)]	No	Yes [2)]	Yes [2) 3)]
Non-standardised banking transactions	Yes	No	No	No	No	Not yet
Insurance products	Yes	No	Yes	No	Yes	Yes

1) Paid-in cash.
2) Via transfer from another account.
3) Via transfer from other means of payment (e-money, credit card, etc.).
4) Up to certain limits.

Kiosk banking. The use of ATMs is quite common in the EU. According to the ECB's statistics, the number of ATMs (including cash dispensers and multi-purpose ATMs)[3] increased considerably within the period from 1993 to 1997, with an EU-wide four-year growth rate of around 50% and even significantly higher growth rates reported in Denmark, Greece, Luxembourg and Portugal, reflecting "catching up" to some extent (see annexed Table A.1). A significant increase in the number of ATM transactions can also be observed. However, the use of kiosk banking seems to differ quite considerably across the Member States. This may be for demand-related reasons, but in some cases banks clearly consider kiosk banking to be only an intermediate step towards PC banking and therefore do not intend to invest further in this channel. In some other countries significant investments have already been made. The range of

[3] The ECB publication *"Payment systems in the EU"* (January 1999) defines an ATM as a "device that permits authorised users (…) to withdraw cash from their accounts and/or access other services, such as balance enquiries, transfer of funds or acceptance of deposits". Therefore, both multi-purpose ATMs as well as pure cash dispensers are included in the statistics.

services available through multi-purpose ATMs is constantly increasing, while the focus has traditionally been on money transmission functions.

Telephone banking. Telephone banking is already quite common throughout the EU. In general, most standardised retail banking services are available through this channel. The responses collected from the EU supervisory authorities indicate that, where telephone banking is most advanced, a 10% level of the retail customer base was reached in 1998 (see Table2). The general thrust of the responses is that the importance of telephone banking has increased quite significantly in the recent past, although there is a lot of country-specific variation, and the growth trend is expected to continue. Very high growth rates were reported from the United Kingdom and Spain. Most banks involved in this activity offer both call centres as well as tone or voice-activated telephone banking systems. Even though automatic voice-recognition systems are operable at a lower cost than call centres with human operators, customers seem to have a clear preference for the latter and tend to request, if possible, always the same bank official, thus highlighting the importance for many retail customers of a personalised service.

Table 2

Indications of telephone banking penetration in some EU countries

Belgium[1) 2)]	5%
Germany[3)]	6%
Spain[1)]	6%
France[1) 4)]	10%
Ireland[1)]	5%
Italy[3)]	3%
Netherlands[5)]	5%
Finland[1)]	2%
Sweden[5)]	4%
United Kingdom[1)]	10%

Source: EU supervisory authorities represented in the Banking Supervision Committee Data refer either to 1998 or to 1997.

1) Percentage of the retail customer base.
2) 1996 figure.
3) Percentage of retail bank accounts.
4) Minitel users.
5) Percentage of payment transactions.

PC banking. Online PC banking is used at present by a significantly lower number of retail customers than telephone and kiosk banking. The current penetration rates tend to represent only a fraction of customers, but growth is generally expected. There are considerable differences between EU countries as to how advanced and extensive the online PC banking services are. Some countries reported that online PC banking is primarily offered to corporate customers (e.g. Belgium, Greece, Spain, Italy and Austria,), whereas others indicate that this channel is offered to both mass retail and corporate clients. There is, however, typically a substantially higher penetration among banks' commercial customers than among their private customers. As to Internet banking, most major banks have established Web sites for information purposes, whereas interactive Web sites for transaction purposes are just starting to be

introduced in most countries on a larger scale. At present, standardised mass transactions and lower-margin business are regarded as the most suitable for promotion via the Internet. Individualised Web sites are not yet offered to customers.

1.3 Future trends in remote banking

Financial institutions seem to be adjusting their technology investments towards PC banking to take into account and further influence the shift of financial services from branches and "traditional" remote channels (kiosk and telephone banking) to computer-based distribution channels. Accordingly, a future reduction in investments in ATMs and branch-teller platform automation is currently expected, while the penetration of "traditional" remote banking methods is still expected to increase as a result of growing customer acceptance of the solutions already available. The spread of customer acceptance appears to depend on the socio-economic background of the clients (primarily gender, income and age), although the importance of socio-economic factors seems to be decreasing. In general, the convenience (24-hour access for seven days a week irrespective of bank branch locations) is perhaps the most convincing argument used to persuade customers to use remote banking channels.

In the foreseeable future it is likely that services offered via online PC banking or the Internet will be more sophisticated than those offered via "traditional" remote banking channels, but still less sophisticated than those provided through face-to-face service. Banks may start using product differentiation to an increasing extent, also in relation to remote banking channels, in order to discourage consumer mobility. Internet banking, as the most recent and innovative remote channel, is regarded as a potential future competitor for online PC banking in some Member States. Online PC banking offers the advantage for banks of being a closed proprietary system without access for competitors, in contrast to Internet banking, where competitors might be just "a mouse-click away" and less customer loyalty might be the result.

Nonetheless, Internet banking is expected to have the highest future growth potential of all remote channels and market participants already anticipate that it will expand considerably within the next two to three years. The overall trend seems to be that more and more financial companies are moving along this path to promote increasingly sophisticated products. The emergence of many suppliers of Internet banking services may boost its use in general, since the ability to choose from several suppliers may attract customers. The Internet can be expected to develop more quickly for investment products than for credits, given, for example, the problems of assessing the creditworthiness of prospective customers. Opinions differ with regard to whether it will be the lower or higher-margin business activities that will have the highest growth rates.

Table 3

PC penetration and estimated Internet users in the European Union

	Household PC penetration, percentage of households (1997 or 1998)	Number of estimated Internet users, percentage of population 1998
Belgium	28%[1)]	14%
Denmark	n.a.	22%
Germany	25%[2)]	9%
Greece	20%[2)]	1%
Spain	25%[2)]	7%
France	15-20%	6%
Ireland	n.a.	11%
Italy	20%	4%
Luxembourg	34%	10%
Netherlands	n.a.	11%
Austria	n.a.	6%
Portugal	14%	2%
Finland	44%[3)]	35%
Sweden	n.a.	33%
United Kingdom	30%[4)]	18%

Sources: Household PC penetration: national source quoted by the EU supervisory authorities represented on the Banking Supervision Committee; Internet use: Nua Internet Surveys (survey dates ranging from January to December 1998, see www.nua.ie). The figures represent both adults and children who have accessed the Internet at least once during the three months prior to being surveyed.

1) Data for end-1996.

2) Percentage of the population using computers.

3) *Estimate for end-1998*

4) Percentage of households with a bank account.

The use of PC banking depends to a large extent on the degree of sophistication of telecommunications networks, the level of PC penetration (see Table3) and usage, and PC literacy. Ongoing progress in these spheres is likely to increase the use of online PC banking and Internet banking. One important factor for Internet banking is, of course, customers' access to the Internet from home or the workplace. In the EU, the highest relative number of Internet users is currently found in Finland, Sweden, Denmark and the United Kingdom.

Recent developments in mobile telephone technology may further contribute to the importance of Internet banking as well as telephone banking, enhancing customer access to banking services. In addition, developments in digital television are expected to further reinforce the trend towards Internet banking.

Turning to possible obstacles, legal frameworks may limit the extension of remote banking in general. For example, the possibility of opening new accounts via remote channels depends on restrictions concerning the requirement of a personal signature. In fact, the development of the electronic signature is likely to be one of the most important steps which will boost the development of remote banking in the short term. Extensive use of cheques might be an important particular obstacle to the extension of PC banking activities to the extent that branch banking continues to be needed for cheques to be paid into accounts. A reliance on cheques could also be an obstacle to the development of small business PC banking. Security

considerations are also very important, especially with regard to Internet banking. Technical analysis of these considerations does not fall within the scope of this study, however. Finally, costs – including the cost of hardware, software and telecommunications – may remain a factor hindering PC banking.

1.4 Increasing use of electronic payment instruments

Payment traffic in general has been subject to a major electronification process (although at apparently different speeds in the various countries of the EU), whereby the replacement of paper-based payment methods by electronic methods has produced significant efficiency gains. Significantly advanced money transmission services via remote banking channels represent an important part of this process. This section provides an overview of the developments in payment habits in the EU in order to characterise the effect of technological advances on the provision of payment services.

It is useful to note first that distinct payment needs are served by specific payment instruments. For each of the three main classes of retail payments – *micropayments*, *point-of-sale (POS) payments* and *bill payments* – the traditional payment instruments and their modern electronic counterparts "compete" against each other for customer preference (see Table4). Micropayments constitute the lowest value payments, e.g. public transport, public telephones and vending machines. Retail POS payments represent day-to-day purchases of retail goods and services and are typically of greater value than micropayments. Bill payments refer to transactions by consumers, businesses and government for the payment of housing, utilities and other services, for large purchases of durable goods, business-to-business payments and government transfers.

Table 4

Overview of different traditional and electronic payment instruments

Payment needs (from low to high transaction value)	**Traditional payment instrument**	**Electronic (substituting) payment instrument**
1. Micropayments	Cash and coins	Card-based e-money
2. Retail POS payments (for retail purchases)	Cash, cheques, "manually handled" debit/credit/retailer card payments	Debit/credit/retailer card payments via EFTPOS terminals; card-based e-money at the point of sale
3. Bill payments	Cheques, credit transfers in paper form	Electronic transfers initiated via multi-purpose ATM, telephone or PC banking
Electronic commerce	Credit cards	E-money (card or network-based)

There are significant differences across EU countries, first, concerning the intensity of cash use (the replacement of cash by various non-cash instruments)[4] and, second, concerning the intensity of the use of the different traditional and electronic non-cash payment instruments (see annexed Tables A.2 and A.3). The first aspect is largely related to macroeconomic conditions, customer preferences and availability and the cost of the non-cash payment instruments, which are influenced by banks' and merchants' policies. Even if the figures bear witness to an increasing willingness to use non-cash payment instruments, cash still remains, according to existing indications, a very important payment instrument. Cash still tends to constitute most of the number of payment transactions, although not the bulk of the value of transactions as cash tends to be used predominantly for smaller value and "spontaneous" transactions rather than for larger value and "regular" transactions. The second aspect is mostly linked to payment patterns that have emerged historically (such as the card payment culture, the use of cheques versus giro transfers) and is also significantly influenced by the action of banks and merchants. Technological development might lead to further standardisation and an erosion of the national differences over time. A detailed analysis of the reasons for the differences across countries is, however, beyond the scope of this report.

In the following, more detailed information is given concerning the adoption of electronic payment instruments within the EU. First, the more established electronic payment means in the field of retail POS and bill payments is considered and, in the subsequent section, the more recent innovation of e-money is investigated.

The primary electronic means for effecting smaller value retail POS payments replacing cash and cheques is the use of debit and credit cards at EFTPOS terminals.[5] EFTPOS transactions also replace those card payments in which the payment information is recorded on paper vouchers. The average value per EFTPOS transaction ranged from ECU 24 to ECU 94 in 1997 within the EU, indicating that card payments are indeed used for relatively low-value POS payments (see annexed Table A.4). The diffusion of this means of payment depends on the availability of EFTPOS terminals as well as the possession of debit and credit cards.

The data reported in the annexed tables imply that the use of debit and credit cards is already very widespread throughout the EU. According to the data on transactions per capita, automated card payments via EFTPOS terminals are particularly widespread in Denmark, France, Luxembourg and Finland (see annexed Table A.4). In terms of debit and credit cards outstanding (see annexed Table A.5) and the overall share of card payments (see annexed Table A.3), the overall importance of card payments is particularly high in Belgium, Denmark, Luxembourg,

4 As an indicator of the differing intensity of cash use in the EU, the ECB publication *"Payment systems in the EU"* (January 1999) reports that the share of banknotes and coins in circulation varies from around 2% of GDP in Finland to close to 11% of GDP in Spain (1997 data).

5 According to the ECB publication *"Payment Systems in the EU"* (January 1999) the term "EFTPOS" refers to the use of payment cards at a retail location when the payment information is captured by electronic terminals, which are also designed to transmit the information. (EFTPOS – *"electronic funds transfer at the point of sale"*).

Portugal, Finland and the United Kingdom. In principle, the increasing use of debit and credit (including retailer) cards can be expected to lead to a further decline in the use of cheques. The reduction in the number of cheques written per capita is one of the most profound changes in retail payment patterns in recent years (see annexed Tables A.2 and A.3). However, in 1997 the share of cheques in the total number of transactions was still above 30% in France, Ireland, Portugal and the United Kingdom.

To some extent, EFTPOS terminals and ATMs can be seen as competitors. First, EFTPOS terminals may be used to withdraw cash, thus reducing the use of cash-dispensing ATMs (if retailers are allowed to distribute cash against card payments). Second, the use of EFTPOS terminals for card-based payments represents the most important substitute for cash payments at present.

In the category of bill payment, the use of ATMs, telephone and PC banking, and pre-authorised direct debits from the payer's account are increasing the share of electronic paperless credit transfers in household credit transfers. Business and government payments have, for a long time, often been executed electronically. While the available statistics on payments are not well suited for quantifying the increase in the share of paperless bill payments, the available indications from the supervisory authorities demonstrate a marked decline in the share of paper-based "handwritten" and manually processed transfers.

1.5 Diffusion of electronic money

When referring to electronic money, a distinction is usually drawn between *card-based e-money* (card-based products or electronic purses) and *network e-money*.[6] Card-based e-money refers to e-money as stored value on cards or prepaid card products that allow consumers to make (small-value) transactions. These e-money products provide the customer with a portable, specialised computer device, typically an integrated circuit card containing a microprocessor chip. Network e-money refers to e-money transactions conducted via telecommunications networks, primarily the Internet. The distinction between card-based and network e-money might cease to be as relevant as previously as card-based e-money becomes used for Internet transactions (via chip card reading devices).

In several countries an electronic purse function is already incorporated into debit cards, eurocheque or ATM cards (see annexed Table A.6). The ECB's statistics estimate the total number of cards with the e-money function at 46 million at end-1997, which is, however, still only a small fraction of the number of cards outstanding with a debit or credit function. At end-1997 the number of purchase terminals equipped for e-money transactions was far lower than

[6] Refer to the ECB publication *"Report on electronic money"*, August 1998.

the number of EFTPOS terminals, but the ratio of e-money loading terminals to ATMs was already 1: 4 in 1997. The fastest growth rates in the number of e-money/smart cards are recorded for Belgium, Germany, Spain, Austria and the United Kingdom (see Table A.6). It should be noted, however, that the relative increases appear large because the initial level was low. The use of e-money predominantly for smallest value purchases is reflected in the average value per purchase, which, at end-1997, was much lower in the case of e-money (ECU 4.0 in 1997) than transactions via EFTPOS terminals (ECU 62).

However, the number of cards outstanding which offer the e-money facility does not necessarily indicate how widely this method of payment is actually used. Existing observations tend to indicate that the use of e-money has taken off more slowly than might have been expected. The use of card-based e-money is not yet very widespread in the EU and most countries are still in an experimental stage, at least when compared with cash or traditional non-cash payment instruments. Developments in the area of network e-money have been even less rapid than those in the field of card-based products.

Customers seem to be adapting their payment habits rather slowly to the use of e-money and in many cases merchants have been resistant to the adoption of e-money readers. One of the crucial issues seems to be who bears the associated costs. The cost considerations of consumers (e.g. e-money loading fee) and merchants (e.g. minimum transaction cost and installation cost) seem to have played an important role, even though there is a possible cost reduction due to reduced cash handling. The problem is also that many customers do not see the benefits of carrying both cash and e-money cards with them. Some other potential impediments to the more widespread use of e-money include:

- insufficient customer information in the introduction phase;
- lack of a "critical mass" to facilitate quick diffusion;
- lack of cross-border compatible schemes in the market due to a lack of international standardisation and multi-currency capability; and
- too little experience of issuers in respect of the reading security of card-based or network products (e.g. in vending machines) and storage media, as well as other technical deficiencies or disadvantages.

As to the future diffusion of e-money, notwithstanding the cost development, the integration of several functions into a chip card (including non-banking products like electronic ticketing) or combining e-money facility with credit or debit cards might go some way towards lower customers' barriers to using e-money. Furthermore, the growing number of e-money purchase terminals might give further impetus to acceptance. The future cross-border use of electronic money will depend to a large extent on the standardisation and interoperability of features as

well as on the solution of security problems, especially in the case of network e-money for Internet use. Progress is expected in these areas in the future.

Despite the impediments mentioned above, card-based e-money could play a significant role in the future in "physical" micropayments, such as those for parking meters, vending machines and public transport ticket machines as well as those made over the Internet. In other words, e-money has the potential to become an even stronger substitute for cash than debit, credit or retailer cards. However, as the future diffusion and market niche of e-money seems uncertain at the moment, there appear to be doubts in the banking industry as to whether the costs involved in setting up the infrastructure to make e-money a successful product can be justified.

Finally, there is an interplay between electronic money and electronic commerce (e-commerce). For the purposes of this report, e-commerce is defined as business activity conducted over the Internet. Many expect e-commerce to expand dramatically in the future. At present, the areas expected to have the highest growth potential, both in business-to-business as well as in business-to-household transactions, are:

- standardised low-value goods and information (books, CDs and newspapers, travel information);
- distribution services (buying via the Internet and home delivery);
- information searches (e.g. travel and investment advice);
- computers and related products (software);
- discount brokerage for commodity services; and
- banking services.

E-money can indeed play an essential role for the further development of e-commerce especially in the area of micropayments on the Internet.[7] The emergence of e-commerce together with internet banking and e-money is an example of one technological innovation reinforcing other innovations. There are also other examples of technological *"mutual reinforcement effects"* in banking. However, the use of e-money is not a prerequisite for the spread of e-commerce. Network e-money will have to compete against credit card payments, strengthened by the new credit card payment mechanisms on the Internet, such as SET.[8]

[7] Micropayments are expected to gain considerable importance with regard to payments related, for example, to the downloading of pieces of information.

[8] SET (Secure Electronic Transactions) promoted by major credit card companies allows the use of credit cards in combination with encryption software from a PC.

2 Technology and banks' strategies

As an all-encompassing development, new technology has important implications for all aspects of banks' strategy and offers major opportunities through investment in the following areas:

1. integration of the latest generation of IT into banks' internal processes, products and distribution methods in order to gain competitive advantages and increase market share, as well as to improve efficiency and risk management;
2. the formation of alliances with technology partners and telecommunications operators in order to create common platforms which allow further developments in the effective application of the most up-to-date IT and to optimise research and development and implementation costs; and
3. diversification into other business areas, such as electronic commerce, non-financial services and becoming "service aggregators".

This Section identifies, first, the cost and revenue-related motives of banks for making these investments, which ultimately influence banks' profitability. It then goes on to investigate the potential implications of banks' and other institutions' strategic choices for the structure of the banking sector through the impact on distribution channels, delocalisation and outsourcing, mergers and acquisitions, strategic alliances and institutional structure (non-bank competition and supermarket banking).

Technology is an important strategic tool for banks to safeguard long-term competitiveness, cost efficiency and profitability. There are considerable potential benefits in many areas of the banking business, as technology enables banks to obtain additional marketing instruments and a better knowledge of the needs and habits of their customers and possibly to achieve significant cost reductions. Banks are generally faced with a strategic choice of when and in what way to invest (which products and distribution channels) in order to exploit the available opportunities and to increase the range of services requested by their customers. Banks may choose to be *"technology leaders"* (in the sense of pursuing a proactive approach towards new technological developments ahead of competitors) or only gradually to adapt their strategies. In any case, banks need to be fully aware of new developments in order to sustain their market position, as barriers to entry tend to diminish and competition can increase significantly. Banks also need to be aware of the risks of being technology leaders, since the followers may have a lower cost burden to bear.

2.1 Cost aspects

Investments in new banking technologies have been attracted by the possibility of achieving significant reductions in the costs of producing various banking transactions, which also promises to lower the overall operating costs.

2.1.1 Banking transactions

The banks of 11 Member States which were interviewed generally expect a clear reduction in the cost per transaction for all banking activities as a result of technological advances, especially for retail securities business, retail payment transactions and retail deposit business (see Table5). The expected cost reductions may be attributable to a number of factors:

- the lower overall cost of automated as compared with labour-intensive processing of transactions due to the streamlining of physical branches and the associated reduction of the labour force;
- the existence of greater *economies of scale* in automated as opposed to labour-intensive processing of transactions and the associated cost savings due to the centralisation of information collection and transaction processing functions;[9]
- the rationalisation of production and distribution structures and the standardisation of banking processes;
- the shorter response times and improved utilisation of customer information; and
- the cross-selling of third-party products, such as travel and insurance products (*economies of scope*).

[9] Economies of scale are present when the average cost per banking transaction falls when the transaction volume increases. This is typically the case with IT-intensive processing of transactions, where the fixed investment and maintenance costs are high in relation to the low variable cost of processing individual transactions. The average cost per transaction falls when the fixed costs are spread over a larger volume of business. Where high start-up investments are not needed, economies of scale should be rather limited.

Table 5

Medium to long-term development of production cost per transaction expected by EU banks [1)]

Retail securities business	-2.79
Retail payment transactions	-2.31
Retail deposit business	-2.15
Wholesale payment transactions	-1.96
Retail lending business	-1.90
Money/asset management	-1.64
Issuance/administration of e-money	-1.62
Wholesale securities business	-1.27
Wholesale deposit business	-1.22
Wholesale lending business	-0.86
Total (unweighted average)	**-1.77**

Source: EU supervisory authorities represented in the Banking Supervision Committee.

1) The table includes the average mean value derived from the responses of banks in Germany, Greece, Spain, France, Ireland, Italy, Austria, Portugal, Finland, Sweden and the United Kingdom. Estimates were given on the following scale (+: cost increase expected; -: cost reduction expected): +/-4: very significant; +/-3: significant; +/-2: moderately significant; +/-1: slightly significant; 0: neutral.

In addition, according to the input from the EU supervisors, considerable reductions in the costs per transaction seem to be achievable. However, the estimates vary considerably. If the cost of a branch personnel-based transaction is set at 100 units, the cost of call centres (personal attendance) is estimated to range from 40 to 71 units, ATM and EFTPOS transactions from 28 to 40 units, and call centres (automatic attendance) from 14 to 25 units. The estimates for Internet transactions range from 1 to 25 units.[10] The relatively high cost of call centres and electronic securities transactions is attributed to the manual activity required.

As a result of an increasing number of transactions and further technological advances, the cost of EFTPOS and PC banking transactions (although already quite low) might decrease further in the future. In particular, computer hardware costs have been decreasing substantially and telecommunications costs have also decreased. These advances mean that the gap between the cost of automated and manual transactions is likely to increase in the future.

2.1.2 Overall operating expenses

Owing to a variety of factors, there is considerable uncertainty concerning the effects of IT investment on banks' overall operating costs, although the potential reductions in the costs per transaction seem undisputed. There may be some over-optimism about the potential size of the reductions and the speed at which they can be realised for the following reasons:

[10] These findings are supported by explicit US estimates. For example, Frei, F., Harkov, P. and L. Hunter,*"Innovation in Retail Banking",* Wharton Financial Institutions Center Working Paper, 1997, (their Table 4) cite survey information from the United States which indicates the following cost per transaction in US dollars: human teller (1.4), telephone banking (human operator) (1.0), ATM (0.4), telephone banking (automated voice response unit) (0.15).

- a relatively large volume (critical mass) has to be built up before overall costs fall in the business areas that exhibit economies of scale. This includes businesses where there are substantial initial investment (and maintenance) costs but low unit costs for executing individual transactions, such as in the processing of mass payment services through computer networks;
- full realisation of the cost savings may require the elimination of existing redundancies (overlapping capacities and "outdated" functions), which may take time;
- considerable time must be allowed for customers to alter their banking habits and make greater use of the new delivery channels, which forces banks to maintain duplicate capacities for different customer segments;
- an apparent quality shift in personnel raises salaries and staff-training requirements.[11] Banks may also increasingly need to raise salaries to avoid a "brain drain" in favour of competitors. This would raise the cost of existing personnel, although total staff costs could fall due to the reduction in the number of employees;
- banks are often forced to invest in the latest versions of hardware and software (which are in the early stages of market introduction usually priced at a high level), or to contribute to software development costs, in order to compete effectively in the IT-related areas; and
- the costs of both IT and labour for banks have been temporarily increased, and may increase further in the short term, because of adjustment to the euro and the need to resolve the Year 2000 problem.

According to the banks interviewed, the overall costs in banking can be expected to decrease only in the longer term, for the reasons given above. However, in most cases the overall cost reductions are not expected to be dramatic. The main effect of technological advances is likely to be a reduction in (variable) payment and other costs related to standardised mass transactions, but the (fixed) costs of maintaining customer relationships and IT-based services are expected to increase.

It is quite difficult to judge the extent to which technological developments have already reduced banks' overall costs, since costs are influenced by several different factors of which technological development is, however, probably the most important. An attempt is made below to characterise in broad terms the development of banks' costs in the EU. As a general caveat, the significant variation across countries in cost development makes it difficult to make generalisations.

[11] There is a shift from administrative functions to more highly qualified staff dealing with the implementation and further development of ever more complex IT systems, as well as employees who make use of these IT-based functions in all areas of the banking business. The costs associated with personnel managed transactions may be expected to increase as well, e.g. in the case of 24hour manned call centres. The changeover to the euro and the Year 2000 problem have also increased the need to invest in a qualified labour force.

On the basis of data published by the OECD, banks' total operating expenses in relation to non-bank deposits (see annexed Table A.9) have – according to the EU weighted average – been showing a tendency to decrease since 1992. Furthermore, the ratio of staff per 1 billion assets in ECU decreased considerably, on average, within the EU in the period from 1985 to 1997 (see annexed Table A.7). These factors suggest a general productivity increase in banking due to technological developments.[12] Moreover, the ratio of staff expenses to the total operating expenses has generally decreased (see annexed Tables A.10-12). This implies that technological developments have reduced the relative use of labour in favour of IT-based production and delivery methods, as expected, and increased labour productivity. Rising IT costs can contribute to the slower reduction (compared with staff expenses) or increase in non-staff expenses.[13] However, few explicit data on the development of banks' IT costs are available.

2.2 Revenue aspects

Banks' decisions to invest in modern banking technologies are not guided by cost considerations alone. Offering new services and service access possibilities is a way for banks and other institutions to attract new customers and hence generate new revenue. Many banks in the EU indeed saw the major influences as being on the revenue rather than the cost side, primarily due to the existence of duplicate capacities.

2.2.1 Customer loyalty and competition

Technology has an important impact on relationship banking, since more data are available on customers' specific needs and behaviour. New technologies allow banks to centralise all available information on each customer, including product preferences. This enables banks to create tailor-made approaches to meet customers' needs and, in theory, to increase customer loyalty, as customers would also benefit from concentrating their banking affairs in a single institution (*"one-stop-banking"*). Hence, information about consumption patterns and lifestyles will be of increasing value for banks' marketing. Marketing initiatives can be expected to focus increasingly on customer profiles. However, customers may be reluctant to accept individualised marketing for reasons of privacy.

Perhaps the most important challenge to customer loyalty is the increasing availability of information and access to the competing services of various financial service providers that are not constrained by physical location. Institutions using telephone or PC-based channels can reach customers irrespective of their own or their customers' location. This development undoubtedly

[12] The use of non-bank deposits or assets as a measure of banks' output is not fully satisfactory, as the relative increase in banks' off-balance-sheet activities is not reflected in this figure. If this were to be taken into account, the figures characterising productivity would show an even greater improvement.

[13] As a caveat, the reduction in labour and the shift from staff to non-staff expenses could also reflect increased outsourcing.

makes it easier for customers to "shop around" for the best offers on the market, thus reducing loyalty to a particular bank and fostering competition. Some non-financial companies are already performing the role of *"information brokers"* to assist customers in this search, and this activity is expected to increase in the future. This tendency might be expected to take hold more in the deposit and securities business than in lending. Banks should not rely on the possibility that customers will keep their main account with their *"house bank"* and conduct only a few transactions with other institutions.

On the basis of the responses by the EU supervisors, a significant decrease in customer loyalty cannot yet be observed. The importance of personal contact is expected to decline only gradually. However, there are increasing signs that customers have become more mobile in their search for the best offer on the market.

There is also increasing pressure from customers for banks to offer remote banking facilities. Customers put increasing emphasis on convenience (with regard to the time, location and speed of service), real-time information and service, privacy and security. This is related to changes in income and time constraints, as well as increasing computer and Internet acceptance among the younger generation of banks' customers. Hence, banks should consider that the adoption of new technologies could be a prerequisite for keeping customers in the longer term, and the decision not to invest or to delay investment might endanger banks' current and especially future market position. Customer demands apparently vary considerably from one country to another, owing, for example, to the different levels of PC and Internet use (see Section 1).

In general, competition from other banks and from non-bank financial institutions is expected to increase and, over time, the borderlines between financial and non-financial institutions are expected to diminish. The possibility of using remote banking channels (especially the Internet) could result in the erosion of established banks' competitive advantages, mainly because extensive branch networks will lose importance as the major barrier to entry. Hence, established banks are forced to increase their cost efficiency.

2.2.2 Pricing policy

According to EU supervisors, banks continue to rely on the policy of cross-subsidisation, as there is usually little price differentiation between the less costly remote banking channels and the traditional channels (with the exception of Internet banking in some countries). Customers are usually (but not everywhere in the EU, see Box 2) offered "standard prices" for using remote channels, whereas more favourable conditions (e.g. in lending or deposit-taking) are usually granted on a face-to-face-basis only. There have even been some cases of pricing use of remote banking higher than use of traditional channels. This means that EU banks are not

commonly using pricing to influence customer choice in favour of use of the automated service options and thus to realise cost savings.

This practice results from, first, strong customer or political resistance (e.g. from trade unions) to higher fees for personalised service, different fees for different customer groups, or even any service fees at all. In the EU many retail banking transactions are traditionally offered without a fee, being charged implicitly from the interest margin earned by the bank. The second reason might be resistance to technology, at least in some customer segments. Specific national conditions or banking traditions may also influence banks' pricing possibilities. However, the situation may differ significantly within the EU. In Finland banks have extensively offered price incentives to encourage the use of new banking technologies (see Box 2).

Box 2

The adoption of new banking technologies in Finland

A comparatively early and fast adoption of new banking technologies characterises the Finnish banking sector, especially following the banking crisis of the early 1990s. One particular objective has been to encourage retail customers to use the cheaper remote channels. This has induced banks to scale down their excessive branch networks and to halve the number of employees within seven years. Nowadays a clear majority of all retail payment transactions are executed electronically by the customer. This technological transformation occurred roughly in three phases. The first phase, which started in the mid-1980s, featured the introduction of ATMs for cash withdrawals and new electronic formats for corporate payment transactions. This period, which preceded the banking crisis in the 1990s, did not lead to significant capacity reductions. The first substantial cost savings were achieved in the second phase, in the early 1990s, when innovations such as multi-purpose payment ATMs and telephone banking were introduced. Finally, in the third phase, which started around 1995 and is still in progress, there has been a surge in Internet banking, which has facilitated further capacity reductions.

Three factors can be identified which explain why banks have been successful in promoting active use of electronic services by their customers: (1) there are no legal restrictions or other impediments to technological innovation; (2) *differential pricing*: as the current charge for paying a bill at a terminal is considerably less than that for an equivalent personal service, pricing clearly provides strong incentives to alter customer behaviour; and (3) there is widespread use of PCs at home, in the workplace and as portable devices. Since the Finnish population is Europe's most active Internet user, the critical mass which is needed to make the provision of banking services via the Internet a profitable business already exists. The average cost of making a payment on the Internet is now only a tenth of that of a payment channelled through traditional services.

In general, increased competition might be expected to create pressure for change in favour of more cost-based pricing and the reduction of cross-subsidisation. If the new entrants, which avoid the costs related to a branch network, gain a market share, the established banks may need to apply differential pricing in order to remain competitive. Nonetheless, banks might continue to face customer and political pressure to retain the current cross-subsidies.

Banks may choose to amortise the implementation costs of the new technologies, either by charging a small number of customers a high price or alternatively by charging a low initial price or no fees at all in order to increase acceptance. According to the EU supervisors, the latter

policy has usually (although not always) been adopted, at least for the time being. It appears also to be the policy followed by the "technology leaders".

2.3 Profitability effects

Responses from 11 Member States indicate that, on average, banks expect a rise in the medium to long-term profitability as a result of technological progress (see Table6). Large banks, however, tended to deliver a more cautious, or neutral, view than smaller banks. In general, retail businesses are expected to be more positively influenced than wholesale businesses, supporting the idea that the effects are indeed more marked on the retail than on the wholesale side. The largest profitability increases are expected in the areas of retail payments, retail securities business and retail lending. The deposit business was expected by some banks to become less profitable as customers might find it increasingly easy to access new investment alternatives offering higher yields.

A warning has to be given in respect of banks' rather optimistic expectations. Increases in competition may lower prices and force banks to pass cost savings on to customers to a greater extent than is currently anticipated. Banks may also not be fully anticipating the extent of potential customer shifts to other institutions offering, for example, mutual funds and other investment alternatives.

Table 6

Medium to long-term effects of technological developments on the profitability of different banking activities expected by EU banks [1)]

Retail payment transactions	+2.58
Retail securities business	+2.02
Retail lending business	+1.67
Wholesale payment transactions	+1.57
Money/asset management	+1.50
Off-balance-sheet business	+1.08
Wholesale securities business	+1.05
Retail deposit business	+0.95
Wholesale deposit business	+0.65
Wholesale lending business	+0.63
Overall profitability	**+2.06**

Source: EU supervisory authorities represented in the Banking Supervision Committee.

1) The Table includes the average mean value derived from responses from banks in Germany, Greece, Spain, France, Ireland, Italy, Austria, Portugal, Finland, Sweden and the United Kingdom. Estimates were made on the following scale (+: increasing profitability expected; -: reduction in profitability expected): +/-4: very significant; +/-3: significant; +/-2: moderately significant; +/-1: slightly significant; 0: neutral.

According to EU supervisors' observations, "technology leaders" might not be the most profitable institutions in the short term due to high start-up costs. In addition, the specialised banks that offer their products and services only or predominantly via remote channels might

not be profitable at the beginning for the same reason and also because of a lack of cross-subsidisation possibilities.

2.4 Impact on the structure of the banking sector

EU banks currently use their IT resources mainly to meet pressing operational challenges such as adaptation to the euro, the Year 2000 problem and the implementation and revision of risk management models. In addition, because there is uncertainty concerning the evolution of demand for the new remote banking products, rather few EU banks have chosen to become "technology leaders". A considerable number of banks offer remote channels for mainly defensive reasons, since their major competitors do so. However, renewed efforts towards more progressive strategies can be expected in the near future. Moreover, internationally oriented strategies might gain considerable importance as a result of the introduction of the euro.

2.4.1 Banking capacity

Technological development has already started to have an effect on branch networks, albeit to a varying extent in different EU countries. One of the decisive elements is whether banks can create new demand or whether the existing demand is to be divided between traditional and remote banking channels. In the latter case, the concerns of excess banking capacity would be amplified. The answer to this question seems to be highly dependent on the particular products concerned. The highest potential for the creation of new demand seems to lie in information services, the execution of securities transactions and other asset management services, the demand for which is generally expected to increase. As banks seem to be inclined to keep all strategic options open, the existing excess capacity may be reinforced, at least in the short term. As reported in the ECB publication entitled *"Possible effects of EMU on the EU banking systems in the medium to long term"* (February 1999), the numbers of bank branches and employees have so far decreased only marginally in the EU as a whole, while significant exceptions exist in individual countries.

Bank branches. The short and medium-term effects of the technological change on branches should be separated from longer-term effects. In the short term, branch networks are expected to remain pivotal for banks. A physical presence is still considered necessary by banks in many countries, as virtual channels are not yet viewed as complete substitutes for branches. In some countries branching is also still necessary for legal reasons.

In the medium term, banks will increasingly have to decide for profitability reasons whether they wish to consider remote channels as substitutes for branches and how best to direct customers to the most efficient channels. If branch levels are not scaled down, banks could run the risk of more cost-efficient competitors that use only remote channels progressively entering the market. Hence, in the long term, technological developments could lead to a significant restructuring of the existing distribution networks. The number of branches may have to be reduced, as remote channels will be more widely used. However, these changes are expected to take place in an evolutionary rather than revolutionary manner.

Bank personnel. The effects of technology on the delivery of banking services and internal organisational structure are expected to lead to an increase in redundancies among bank employees, as previously manual routines become automated. The changing nature of banking may not necessarily reduce the overall numbers of bank personnel as operations such as marketing and sales require qualified personnel and new jobs, and new roles will probably need to be created within the organisation (call centre operators, Web site operators, technical support functions, etc.). At present, a reduction in the number of staff per branch office can be observed in the majority of countries, possibly reflecting the reduction in the personnel handling banking transactions (see annexed Table A.8). However, this ratio has exhibited large differences across countries.

2.4.2 Outsourcing and delocalisation

Outsourcing is most common in the areas of (1) technological support and (2) non-core banking activities. Outsourcing is generally expected to increase in the future, although for many countries there is at present no clear evidence in favour of further outsourcing. Technological support is outsourced mainly in the areas of IT helpdesks, system developments (e.g.Internet banking), foreign exchange back offices, development of risk management software, and in particular, the development of payment systems including cards (mostly outsourced to companies which are owned or controlled by banks). In some countries, outsourcing has resulted in a country-wide co-operation across payment systems and the concentration of the processing of payments in specified firms (or even a single firm) jointly owned by banks (Belgium, Denmark, Portugal, Finland and Sweden). In the case of non-core banking activities, outsourcing refers, for example, to catering, printing, security functions including the transportation of valuables, and document processing and filing.

Mounting pressure on in-house IT (generated by the Year 2000 problem, the changeover to the euro, regulatory requirements and mergers) has increased demand for outsourcing or the employment of external specialists due to a shortage of in-house skills. The other main reasons for outsourcing quoted by the supervisory authorities are related to efficiency improvements

due, for instance, to economies of scale (especially in processing mass payment transactions), flexibility (avoiding commitment to permanent staff) and reduced labour costs.

Technology is not regarded as a major driving force for *delocalisation*, i.e. the transfer of operations to a new location in order to save staff and other expenses. No major trend towards delocalisation can be observed in the EU, apart from the delocalisation of, for example, call centres from cities to rural areas. An important impediment to delocalisation is the potentially significant increase in communication costs as well as, in some cases, the difficulty of keeping high quality staff.

2.4.3 Mergers and acquisitions and strategic alliances

Most responses by supervisors suggest that technology has not been a major driving force for *mergers and acquisitions* among banks. Technological development may have even sometimes obstructed a bank merger, as merging incompatible systems can be very costly in the short term, also limiting the IT resources available for other purposes. Further problems might arise when banks belong to a different joint venture/co-operation agreement. However, in the medium to long term, cost savings seem to be achievable by the use of more efficient technologies in merged banks, and some banks have mentioned the increasing cost of technology as one reason for merging. According to these banks, a critical size is needed in order to be able to amortise the increase in investments necessary to follow technological developments and remain competitive.

Strategic alliances and co-operation agreements among banks currently exist both on the production and the distribution side. The main incentives for co-operation arise from the increasing necessity to share IT development costs, to reap economies of scale and to provide interoperable systems, e.g. common platforms for the use of ATMs, compatible payment instruments (such as debit cards accepted on a country-wide basis) and compatible technical standards (e.g. digital security arrangements). There are, however, concerns in the banking sector that competitive disadvantages may arise if products cannot be offered ahead of competitors that are taking part in the same co-operation agreement. Other concerns are related to the fact that banks would be increasingly dependent on external partners. At present, co-operation agreements are most commonplace in co-operative and savings bank sectors through their central organisations which are owned by the banks belonging to the sector.

Potential synergies between banks and non-banks in the area of IT developments might be considerable. There are examples of joint ventures aimed at facilitating the introduction of new technology by creating common standards. On the distribution side, further non-bank alliances might develop, reinforced by the expected evolution of e-commerce and cross-selling initiatives,

e.g. with regard to insurance products or travel agents. In addition, mergers and acquisitions between banks and IT service providers have been and could in the future be used as early "countermoves" against the growing competitive threat that IT companies present for banks.

In general, co-operation between the banking industry, telecommunications and IT sectors and governments seems to facilitate the establishment of the necessary technical infrastructure and to support the increasing use of remote banking technologies. This co-operation can produce significant customer benefits through, for instance, widely acceptable payment means (such as universally accepted debit cards) and can increase efficiency through economies of scale. However, extensive co-operation between banks may hinder the development of new products and technical solutions and lead to the risk of collusion on fees charged to customers.

2.4.4 Non-bank competition

Competition from non-bank institutions is not currently taking place on a large scale in the EU, but it is likely to represent an increasingly important challenge to banks. At present, banks have two major advantages over non-bank financial institutions: general public confidence and trust and a monopoly position in deposit-taking from the public. Potential non-bank competitors for banks, such as securities brokers, finance companies, insurance companies, IT firms, telecommunications companies, supermarket chains and media enterprises are not entitled to take deposits from the public. Banks could possibly exploit this position, for example through co-operation agreements between banks and the commercial sector as well as between banks and credit card companies.

In principle, the securities and investment business (mutual funds, investment accounts and securities intermediation), payment transfers and advice services are among those that are most likely to face non-bank competition in the future, also via remote banking channels. New suppliers of remote banking services use the latest technology, which enables them to compete at the lowest possible price. However, new players entering the market have to face the same IT development costs as their already established competitors, and may have fewer resources. Outside competition might also be expected from software houses managing companies' payments via electronic means, telecommunications carriers, mailing companies (e.g.electronic bill presentation via the Internet), credit card companies or major supermarket networks.

2.4.5 Supermarket banking

Owing to their extensive geographical coverage, supermarkets seem to offer a good "physical" distribution channel for retail banking-type products in connection with the acquisition of

consumer goods. To date, the following patterns of supermarket banking have been reported for the EU:

A. *Banks' presence in supermarkets.* Banks use supermarkets to provide cash and non-cash services in Spain (300 bank branches in supermarkets), Ireland, the Netherlands, Finland, Sweden and the United Kingdom. Banks have started to set up branches or to provide limited services in supermarkets in Germany and Ireland.

B. *Banks' and supermarket chains' strategic alliances/joint ventures* :

- supermarkets act as distribution agents for banks which operate without a branch network (Spain);
- supermarkets offer consumer credits, insurance and savings products in an association with banks (France, Portugal and the United Kingdom);
- supermarkets offer credit cards linked to a bank account; and
- supermarkets and banks experiment with PC and telephone banking in combination with the home delivery of goods (the Netherlands).

C. *Supermarkets' banking activities on a stand-alone basis.* This development involving a banking subsidiary of a supermarket chain was reported in Portugal and, particularly, the United Kingdom, where the provision of financial services by retail outlets has existed since the mid-1980s. Furthermore, the addition of banking activities to the existing cash management functions of supermarket chains can offer the potential to exploit economies of scope.[14] Competition with banks is expected to intensify in the future in core retail banking areas such as payments, deposits and consumer loans, because an increasing number of supermarket chains seem to be considering entry into banking.

[14] In Sweden it is possible for non-financial companies (for example, supermarket stores) to take payments in advance up to a limited amount (of SEK 15,000). The advanced payments are deposited with the company, but they can only be used for buying the goods of the same company. When purchasing goods, it is, however, possible to withdraw cash (up to SEK 300). This kind of activity does not require a banking licence.

3 Effects of technology on risks in banking

In general, technological developments have an impact on the overall risk profile of banks. Based on the responses of the EU supervisory authorities, the possible effects of IT developments on the main categories of banking risks are examined in this section. It should be noted that risks can be heightened in some areas (e.g. legal risk) and reduced in other areas (e.g. monitoring of credit risk).

3.1 Strategic risks

Technology accelerates the underlying speed of change in the banking industry (e.g.the traditionally strong bank-customer relationships can weaken) and, hence, banks are required to increase their awareness of their strategic risks in general. Moreover, IT becomes an increasingly important strategic factor in the competition between banks and between banks and non-banks. The specific strategic risks could include:

- increasing competition from niche banks and non-banks operating via the remote banking channels with those banks which currently operate primarily via traditional distribution networks;
- worsening excess capacity problems and unsustainable cost structures;
- excessive investment in particular products/services that are not accepted by customers or in technical solutions which might become rapidly outdated;
- an unexpectedly long time-lag to generate the planned returns on IT investments; and
- excessive competition for the most profitable customer segment, as many banks may concentrate – when promoting remote channels – on the same groups of customers.[15]

IT development has to be consistently incorporated into banks' overall strategies, and technology investments (e.g. in remote banking channels) require a well-designed strategy. As banks' IT resources are short at the moment (owing to the euro and the Year 2000 problem), their ability to undertake the development of new products and distribution channels constitutes a cause for concern. This is heightened by the perceived lack of IT representation at banks' higher management levels.

3.2 Legal risks

Banks' legal risks are expected to increase owing to the uncertainty surrounding the applicable laws and regulations, such as the legal status for remote banking, the validity and proof of

[15] This could be especially relevant for banks which start to make the related IT investments later than their competitors. As a consequence, the gap between successful and unsuccessful banks in this field might widen in the longer term.

transactions, the respect of customers' privacy, exposure to fraud and attempts at money laundering, involuntary exposure to foreign jurisdictions, the applicable jurisdiction (for example, in the case of cross-border Internet transactions), and legal responsibility in the event of a breakdown of operating systems. The current global debate on aspects of data protection highlights the importance of having an appropriate legal framework in third countries as well as in respect, for instance, of the use of personal data on the Internet.[16] Legal agreements are especially important for the future of e-commerce.

Legal disputes may also arise about the question of whether the risks resulting from new remote channels are evenly distributed between banks and customers. The relevant areas include disputed cash withdrawals, the sharing of responsibility between banks and customers for ensuring the security of remote banking systems, the vulnerability of online PC and Internet banking systems to hacking attempts and the extent of banks' liability for losses arising from the breakdown of computer systems.

With regard to the legal framework concerning digital signatures and encryption laws, the following diverging tendencies were noted: no specific digital or encryption laws are in force in Belgium, Denmark, Greece, Spain, the Netherlands, Austria, Portugal or Sweden as EU legislation is expected to be passed first.[17] New legislation in this context is expected within a year in Finland. In France, Italy, the Netherlands and Austria,[18] there is no legal provision to prevent banks from basing transactions purely on digital signatures. However, legal problems exist in relation to the requirement to have manual signatures in some countries. Generally, supervisory authorities are not involved in these discussions (with the exception of Luxembourg, Austria, Finland and Sweden). Therefore, it seems necessary that the responsible national authorities should take the initiative to establish the appropriate respective legal standards to ensure a level playing-field for the domestic banking system.

Authentication services can be offered (in theory) by individual banks, bank consortia or a joint venture on the part of banks and IT providers. Currently, a major world-wide initiative is being undertaken in the form of a joint venture by large international banks to develop a common standard for digital certification.

3.3 Operational risks

The increasing ability to manage information is improving transparency within banks and making banks' management information systems (MIS) and risk control systems more efficient as the

16 This refers, for example, to data-mining and marketing strategies derived therefrom, the registering of hits on Web sites and tracing back to the respective Internet user.

17 See the text of the proposed European Parliament and Council Directive on a common framework for electronic signatures (accessible under http://europa.eu.int/comm/dg15).

18 In many countries the customer has to present himself/herself in person when he/she wishes to open an account.

amount and timeliness of information improve (e.g. real-time account balances). However, banks are at the same time becoming more subject to the operational risk of technological failures. Moreover, open systems such as the Internet exposes banks' systems to an increasing degree towards external intrusion. As IT disruptions can be very costly, banks need to have extensive backup facilities.

It is important that banks are aware of the following operational risks related to technological development:

- the risk of mishandling of IT-based products by customers or employees due to, for example, mistakes in business manuals or a lack or poor quality of information and staff expertise;
- the risk of inadequate safety of the IT infrastructure, such as software and hardware safety as well as appropriate database organisation and control of internal fraud (e.g. unauthorised access to customer information), and inappropriate handling of security requirements by customers and employees, such as the sharing of passwords;
- the risk of inadequate IT coverage, such as an insufficient information system (incomplete and inaccurate databases);
- risks related to banks' joint or interconnected networks. Banks can become too dependent on third parties (e.g. a very limited number of hard and software providers) and contracts with hard or software providers may not be enforceable; and
- risks related to outdated technology and software programming languages. There are concerns that such systems will not be sufficiently robust to undertake many of the new functions required, even if they are tested for Year 2000 compliance. The ill-designed and/or incomprehensive integration of old software into new software might also create risks.

The main risks related to outsourcing are linked to control and risk-management issues as well as to the strategic risk to the extent that in-house know-how is lost. IT excellence is usually viewed as a very important competitive factor. In mergers and acquisitions, technology risks might arise, in particular, in the immediate post-merger period, when two formerly independent IT systems have to be combined.

Certain reputational risks are clearly linked to banks' operational risks. The potential causes for a bank's reputation being tarnished include the emergence of malfunctions or security breaches in e-money schemes or in remote banking systems; the inability to solve IT-related problems with customers; the reduction in the convenience of using services; and breaches of data and consumer-protection issues. As a consequence, banks might lose customers and have to face a downgrading of their ratings.

3.4 Credit and market risks

A general concern related to credit risk is associated with banks' strategic risks, namely that the more flexible relationship between banks and their customers could also affect credit relationships, possibly causing an increase in the credit risk due to adverse selection in loans.

With regard to the capability of managing credit and market risks, the effect is clearly positive, as IT developments have made it easier to quantify, price and manage risks. At the wholesale level, the development of models by a number of banks based on statistical techniques for measuring, managing and controlling market risk has already received recognition from supervisory authorities. More recently, similar statistical techniques have been employed to develop credit risk models which would better reflect the risks of lending by computing the default probabilities related to the credit portfolio. Banks may also increasingly employ formalised credit scoring techniques in order to better assess clients' creditworthiness. However, doubts have been expressed in respect of the soundness of the methodologies used in credit risk modelling and credit scoring (e.g. in view of the fact that information is only available with a time-lag) and on account of the fact that widespread application of these models may encourage undesirable "herding behaviour".

There are also hazards related to the reliance on models in risk management. The models may be incorrectly specified or insufficiently robust to deal with unusual situations or extreme market movements. For example, excessive reliance on the value-at-risk (VAR) models might pose a risk in itself. VAR models should not be seen as tools enabling banks to evaluate precisely the actual maximum loss which might arise, as extreme events could generate much bigger losses. Although further risk-management techniques are likely to emerge, the overall role of VAR models is likely to remain important. For these reasons, the importance of stress tests to overcome these drawbacks and assess the worst case scenarios has to be pointed out, especially in the light of the latest market turmoil prompted by the financial crises in emerging markets.

3.5 Systemic risk

The following aspects of technological development can heighten systemic risk, because problems may be concentrated on specific *"nodal points"* and they may be increasingly propagated and passed on from a bank to bank (even from a country to country):

- many market participants may use the same or similar software and hardware subject to identical problems;
- institutions' risk management models (such as VAR) may be subject to the same shortcomings (that become evident in times of extreme market conditions);

- outsourcing may lead to the concentration of operational functions (i.e. payment processing) and hence operational risks in a few institutions, or sometimes even in a single institution on which banks are dependent; and
- herding behaviour may become worse, heightening market movements (such as "flights to quality") or drying up market liquidity as information spreads more and more rapidly and trading decisions are made with ever-increasing rapidity.

However, there are also elements that can reduce systemic risk:

- advanced management information systems (MIS) improve banks' business and risk management;
- consequently, the risk awareness of senior management may increase and possible drawbacks in organisational structures may be more easily detected;
- technological improvements in the processing and settlement of payments can lower the cost and hence increase the use of safer systems (such as RTGS) rather than cheaper-to-use but riskier systems; and
- new technologies provide banks with quicker access to liquidity.

4 Supervisory issues

The new banking technologies present challenges not only for banks but also for the activity of banking supervisors since they need to assess the implications for banks' risks and to adopt appropriate responses. As a result, EU banking supervisors have reviewed and are reviewing their own tools and assessment procedures. In particular, with regard to off-site examination, some supervisors have put in place formal risk assessment procedures to assess banks' technology-induced risks. With respect to on-site inspections, specific IT examinations have been and are being conducted, covering, for example, IT-related aspects of the introduction of the euro and the Year 2000 problem, checks of databases and computer procedures, IT-related strategies, the organisational structure and staff for IT management, IT security, the completeness and accuracy of data, management information systems, and sometimes also Internet banking.

More generally, supervisors consider very useful the sharing by supervisors, on a cross-border basis, of information on how the supervised banks are coping with the strategic and operational challenges and how the day-to-day supervision of these issues is being organised. This exchange of information may cover detailed supervisory practices and formalised assessment schemes, as well as guidelines and checklists. At the national level co-operation is in some cases extended to external auditors since in many countries their examination also focuses on operational risk related to IT.

As to qualitative and quantitative standards for the containment of the operational risk associated with IT, specific guidelines have been issued by banking supervisors in several EU countries to guarantee that banks have proper internal control systems in place on an ongoing basis. These guidelines normally underline the importance of the commitment of banks' top management to manage technology risks (e.g. by having backup plans and adequate information systems' security in place). In greater detail, the guidelines aim to ensure that banks:

- have an efficient management information system to handle the increasingly complicated business operations and environment;
- have policies and procedures in respect of the identification, assessment and controlling of the IT-related operational risks, including the security aspects;[19]
- have adequate control over outsourced IT-software development or functions of IT departments' activities, including the responsibility and accountability of external service providers. Namely, liability issues may arise if the products are not error-free and banks themselves could be held liable for their customers;

[19] See also the Basel Committee on Banking Supervision, *"Risk management for electronic banking and electronic money activities"*, March 1998.

- do not outsource the management of risks, since the ultimate risk management responsibility should always lie with the banks themselves.

The development of IT in banking is likely to present challenges also to the regulatory framework for banking supervision both at the national and the international level. Some issues can be identified as follows. First, the appropriate supervision of non-bank institutions undertaking banking activities. For example, a need may have already arisen to establish a clear responsibility vis-à-vis customers if activities equivalent to deposit-taking have emerged and to ensure that customers are aware of the institution with which they are dealing.

Second, the cross-border activities of banks using remote banking channels. The use of this channel might facilitate the establishment of banks' headquarters in offshore centres where less stringent regulation and supervision exists. In particular, the supervision of Internet banks might become an important issue, since banks which are not subject to the EU banking legislation will be able to provide their services and sell their products throughout the EU. As Internet banks are not, in practice, bound by any national borders, cross-border co-operation among supervisory authorities is essential in this area.

Third, the cross-border dimension of some aspects related to technological development is gaining increasing importance in order to ensure the smooth functioning of the single banking market and an adequate containment of the risks that might spill over to other countries' banking systems. This is certainly true for such issues as accepted encryption techniques, digital signatures and authentication procedures. In this field, the pursuit of a consistent EU-wide legal framework might be advisable.

Finally, public awareness of the advantages as well as of the risks associated with the use of technology in retail banking, needs to be enhanced. With regard to Internet banking in particular, it might prove crucial to enable customers to recognise which financial service providers are properly supervised and which products fall within the scope of deposit insurance. Customers should be aware, for example, of the existence of dubious or fraudulent Internet sites claiming to provide banking services. In particular, public awareness of the existing domestic and international lists of bona fide regulated institutions (such as the list of EU credit institutions published by the European Commission) could be further promoted.

Conclusions

The IT and telecommunications industry will constantly develop new technical solutions that can be exploited in the financial industry. Competition with established banks is likely to increase significantly from other banks and non-bank financial institutions as barriers to entry into various areas of the banking industry diminish. Stage Three of Economic and Monetary Union (EMU) will give further impetus to banks to increase efficiency as competition can be generally expected to increase further. The challenge for the banking sector is to adapt to these developments.

Technological advances have already had an important streamlining impact on banks' internal administrative processes. Banks have already long been aware of the potential for increased efficiency generated by replacing manual or paper-based internal operations with automated procedures. The millennium issue, EMU and the general development of IT accelerate this process significantly. Moreover, technology increasingly influences banks' products and delivery methods. In the short to medium term, major efforts will continue with a view to making standardised mass products more efficient, whereas, in the longer term, more complex and individualised products are likely to be the main target for innovation in retail banking. In addition, the possibility of selling technological products to banks which wish to adopt technologies at a later stage could offer an additional income for "technology leader" banks.

At present, remote banking activities have often been considered as only a complementary service. In the future, however, remote banking may become an increasingly important part of banks' overall strategy. The more traditional remote channels (kiosk banking and telephone banking) have to be distinguished from the more innovative remote channels (online PC banking and Internet banking), the development of which is still in the early stages although considerable expansion is anticipated. These new banking methods are expected to increase banks' cross-border activities, also in retail banking. As banks are still largely in the experimentation phase in this respect and it is quite difficult to foresee which particular products will be the most successful, there is a possibility of failure related to particular solutions. Another important aspect is that IT developments take place rapidly and, therefore, banks which make the necessary adaptations either too early or too late might face difficulties.

Increasing recourse to remote banking options will affect the overall structure of the banking system, first and foremost with regard to the numbers and functions of banks' branch offices and the progressive outsourcing of IT-related functions, particularly in relation to the processing of payments. Pressures to reduce personnel may be reinforced by the clear shift in the direction of a more qualified labour force.

Currently, in spite of the already widespread use of IT in internal procedures and the existing installation of remote banking facilities, which have reduced the costs per banking transaction

considerably, it is hard to detect significant increases in banks' overall cost efficiency. This might be due to the large initial investment costs, the slow changes in customers' banking patterns and the need to maintain many parallel distribution channels, hence the slow removal of excess capacity and the increased cost of the existing labour force due to increasing educational and training requirements and technical skills. Moreover, the transitional phase related to the changeover to the euro and the Year 2000 problem temporarily increases banks' costs.

It may be questionable whether it will turn out to be a successful strategy for banks – in the long run – to offer all (i.e. traditional and remote) distribution channels. On the one hand, offering the full range of products and services might induce customers to go in for "one stop banking"; on the other, higher economies of scale or other cost advantages might be achievable only through specialisation.

Banking supervisors, for their part, need to be aware of banks' strategic, legal and operational risks associated with the technological development, including possible implications for systemic risk. They have already taken steps in this direction.

ANNEXES

Table A.1

Cash dispensers and ATMs

	Number of machines per 1,000,000 inhabitants (end of year)						Number of transactions per capita						Average value per transaction (ECU)					
	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97
BE	280	313	360	414	492	+76%	11	13	14	15	16	+40%	98	102	105	106	104	+6%
DK	108	142	207	239	253	+134%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
DE	308	361	437	459	504	+64%	n.a.	11	13	15	n.a.	n.a.	n.a.	133	150	146	n.a.	n.a.
GR	82	155	129	185	209	+155%	n.a.	4	4	6	6	n.a.	n.a.	102	136	133	162	n.a.
ES [1) 2)]	557	600	680	775	863	+55%	12	13	14	15	15	+27%	88	84	84	85	82	-6%
FR	325	355	393	420	462	+42%	13	14	16	18	20	+51%	66	64	62	63	62	-6%
IE	220	241	257	290	286	+30%	16	16	18	21	24	+54%	63	71	68	76	65	+3%
IT	262	321	371	422	444	+69%	3	5	5	6	7	+117%	168	165	149	160	163	-3%
LU	294	374	456	537	613	+109%	10	10	9	10	10	+5%	114	125	118	118	113	-1%
NL	292	325	355	373	410	+41%	21	24	27	29	33	+61%	82	82	83	83	78	-5%
AT	320	381	420	479	533	+67%	7	8	8	9	10	+38%	134	138	144	142	135	+1%
PT	283	337	372	541	631	+123%	10	12	14	18	21	+120%	57	54	54	61	60	+6%
FI [2) 3)]	591	557	474	448	445	-25%	40	38	39	42	43	+8%	51	61	66	66	67	+32%
SE	255	260	266	269	268	+5%	28	31	32	34	35	+24%	87	88	86	95	92	+6%
UK	328	343	358	376	393	+20%	21	23	25	27	30	+41%	62	63	59	61	74	+20%
EU [***4)***]	***324***	***363***	***408***	***448***	***488***	***+51%***	***14***	***14***	***16***	***17***	***20***	***+46%***	***94***	***102***	***104***	***105***	***97***	***+3%***

Source: European Monetary Institute, "Payment Systems in the European Union" (April 1996) and subsequent addenda (January 1997, January 1998), and the European Central Bank, "Payment Systems in the European Union, Addendum incorporating 1997 figures" (January 1999).

1) In "Average value per transaction": only cash withdrawals.

2) Since 1995 a new source of data has been used and some of the 1995 figures may therefore differ from those contained in the "Addendum" (January 1997).

3) Only cash dispensing ATMs.

4) Average without countries where data are not available.

Table A.2

Use of cashless payment instruments: number of instruments per inhabitant

	Cheques						Payments by debit/credit/retailer cards						Credit transfers						Direct debits					
	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97
BE	14	12	12	11	9	-35%	17	19	21	25	28	67%	59	64	66	68	68	16%	9	10	10	11	12	37%
DK	23	21	18	16	14	-38%	34	41	47	54	59	72%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	13	14	17	18	20	51%
DE	12	11	10	9	9	-22%	4	4	5	6	6	66%	65	68	69	72	75	16%	53	57	58	59	66	25%
GR	n.a.	n.a.	~0	~0	~0	n.a.	2	3	2	3	2	15%	n.a.	0	n.a.	~0	1	n.a.	n.a.	n.a.	~0	~0	~0	n.a.
ES [1]	6	5	6	5	6	8%	6	6	8	7	9	55%	n.a.	n.a.	5	6	6	n.a.	n.a.	n.a.	16	17	19	n.a.
FR	85	84	83	85	84	-1%	27	29	32	36	39	44%	27	28	29	30	32	20%	17	20	21	23	24	38%
IE	46	44	43	53	54	17%	6	6	8	9	9	52%	20	21	26	25	29	46%	9	9	12	15	17	93%
IT	17	12	10	12	11	-34%	2	2	2	3	5	184%	19	17	16	16	17	-10%	2	2	2	3	3	90%
LU	n.a.	6	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NL	12	9	7	7	5	-58%	6	13	24	24	31	417%	95	99	85	86	89	-7%	31	35	39	42	46	47%
AT	5	4	4	3	3	-40%	2	2	3	4	5	135%	50	54	54	57	58	15%	24	23	26	25	27	15%
PT	26	26	24	26	27	3%	11	12	14	20	25	137%	3	4	4	4	5	62%	3	4	6	7	7	143%
FI	1	1	1	1	1	-24%	42	45	48	53	57	37%	77	78	82	83	86	12%	n.a.	n.a.	n.a.	5	5	n.a.
SE	6	n.a.	n.a.	n.a.	n.a.	n.a.	8	11	13	14	20	156%	68	69	70	72	75	11%	5	5	6	6	7	53%
UK	50	48	46	45	44	-11%	24	28	33	39	45	86%	24	24	25	27	28	19%	18	20	22	25	27	50%
EU [2]	***30***	***29***	***27***	***28***	***27***	***-11%***	***11***	***n.a.***	***16***	***19***	***21***	***84%***	***n.a.***	***n.a.***	***38***	***38***	***40***	***n.a.***	***n.a.***	***n.a.***	***27***	***29***	***31***	***n.a.***

Source: European Monetary Institute, "Payment Systems in the European Union" (April 1996) and subsequent addenda (January 1997, January 1998), and the European Central Bank, "Payment Systems in the European Union, Addendum incorporating 1997 figures" (January 1999).

1) Since 1995 a new source of data has been used and some of the 1995 figures may therefore differ from those contained in the "Addendum" (January 1997).

2) Average without countries where data are not available.

Table A.3

Use of cashless payment instruments: percentage of all payment transactions [1)]

	Cheques					Payments by debit/credit/retailer cards					Credit transfers					Direct debits				
	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997	1993	1994	1995	1996	1997
BE	14%	12%	11%	9%	8%	17%	18%	19%	21%	23%	60%	61%	61%	59%	58%	9%	9%	10%	10%	10%
DK	n.a.	n.a.	n.a.	18%	15%	n.a.	n.a.	n.a.	61%	63%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	21%	21%
DE	9%	8%	7%	6%	6%	3%	3%	4%	4%	4%	49%	49%	49%	49%	48%	40%	40%	41%	40%	42%
GR	n.a.	n.a.	n.a.	10%	12%	n.a.	n.a.	n.a.	78%	74%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	3%	3%
ES [2)]	n.a.	n.a.	16%	14%	13%	n.a.	n.a.	23%	19%	21%	n.a.	n.a.	15%	15%	14%	n.a.	n.a.	46%	44%	45%
FR	54%	52%	51%	48%	46%	17%	18%	19%	20%	22%	17%	17%	17%	17%	17%	11%	12%	13%	13%	13%
IE	57%	55%	49%	52%	50%	7%	8%	9%	9%	9%	25%	26%	29%	25%	26%	11%	11%	13%	15%	15%
IT	43%	38%	33%	31%	28%	5%	6%	8%	9%	11%	48%	51%	54%	43%	42%	4%	5%	5%	7%	9%
LU	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
NL	8%	6%	5%	4%	3%	4%	8%	16%	15%	18%	66%	64%	55%	54%	52%	22%	22%	25%	27%	27%
AT	6%	5%	5%	4%	3%	3%	3%	4%	4%	6%	62%	64%	62%	64%	62%	29%	28%	30%	28%	29%
PT	61%	56%	50%	45%	41%	25%	25%	29%	34%	39%	7%	9%	9%	8%	7%	7%	10%	12%	11%	11%
FI	n.a.	n.a.	n.a.	1%	~0%	n.a.	n.a.	n.a.	37%	38%	n.a.	n.a.	n.a.	59%	58%	n.a.	n.a.	n.a.	3%	3%
SE	7%	n.a.	n.a.	n.a.	n.a.	9%	n.a.	n.a.	15%	19%	79%	n.a.	n.a.	79%	74%	5%	n.a.	n.a.	7%	7%
UK	43%	40%	37%	33%	31%	21%	23%	26%	29%	31%	20%	20%	20%	20%	20%	16%	16%	18%	18%	19%
EU [3)]	***n.a.***	***n.a.***	***25%***	***25%***	***23%***	***n.a.***	***n.a.***	***15%***	***17%***	***18%***	***n.a.***	***n.a.***	***35%***	***35%***	***34%***	***n.a.***	***n.a.***	***25%***	***26%***	***26%***

Source: European Monetary Institute, "Payment Systems in the European Union" (April 1996) and subsequent addenda (January 1997, January 1998), and the European Central Bank, "Payment Systems in the European Union, Addendum incorporating 1997 figures" (January 1999).

1) Figures do not sum to 100% when there are unclassified payment transactions.

2) Since 1995 a new source of data has been used and some of the 1995 figures may therefore differ from those contained in the "Addendum" (January 1997).

3) Average without countries where data are not available.

Table A.4

EFTPOS-terminals

	Number of machines per 1,000,000 inhabitants (end of year)						Number of transactions per capita						Average value per transaction (ECU)					
	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97
BE	4,255	4,941	5,513	5,973	6,284	+48%	16	18	21	24	27	+73%	54	57	59	59	58	+8%
DK	4,197	4,624	5,016	7,966	11,923	+184%	33	40	46	52	58	+75%	43	45	47	47	46	+8%
DE	345	768	858	1,404	1,984	+475%	1	1	2	3	3	+252%	46	54	73	80	65	+40%
GR	241	1,083	1,082	1,796	2,831	+1,075%	n.a.	1	1	1	1	n.a.	n.a.	66	64	75	74	n.a.
ES [1]	8,287	10,222	12,275	14,650	16,691	+101%	6	6	8	8	9	+55%	43	42	41	50	48	+11%
FR	9,193	9,343	9,340	9,353	9,555	+4%	27	29	32	36	39	+44%	49	49	48	48	46	-7%
IE	n.a.	n.a.	n.a.	1,213	1,402	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a	n.a	n.a	n.a	n.a.
IT	1,329	1,786	2,634	3,741	4,896	+268%	0	1	1	3	4	+946%	104	99	89	93	94	-10%
LU	8,390	9,071	8,146	11,218	11,071	+32%	22	29	37	39	45	+104%	66	69	68	69	66	+0%
NL	1,606	3,094	4,747	6,184	7,715	+381%	4	8	17	24	31	+607%	50	53	45	44	43	-14%
AT	229	300	419	632	1,652	+621%	1	1	1	2	3	+258%	38	42	49	55	54	+41%
PT	2,790	3,311	3,862	4,990	6,022	+116%	8	9	13	18	22	+188%	32	32	31	24	24	-24%
FI	8,291	9,434	9,593	9,952	10,506	+27%	34	38	43	46	51	+49%	34	37	42	43	45	+34%
SE	3,054	2,908	6,139	6,945	7,778	+155%	7	9	10	13	16	+121%	57	68	62	73	69	+20%
UK	4,640	5,997	8,635	9,354	8,984	+94%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a	n.a	n.a	n.a	n.a.
EU [2]	***3,836***	***4,577***	***5,544***	***6,417***	***7,146***	***+86%***	***9***	***10***	***11***	***14***	***16***	***+83%***	***57***	***59***	***61***	***66***	***62***	***+8%***

Source: European Monetary Institute, "Payment Systems in the European Union" (April 1996) and subsequent addenda (January 1997, January 1998), and the European Central Bank, "Payment Systems in the European Union, Addendum incorporating 1997 figures" (January 1999).

1) Since 1995 a new source of data has been used and some of the 1995 figures may therefore differ from those contained in the "Addendum" (January 1997).

2) Average without countries where data are not available.

Table A.5

Number of cards per 1,000 inhabitants (end of year)

	Cards with a cash function						Cards with a debit or credit function						Cards with a cheque guarantee function						Retailer cards 4)				
	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997	Change 1993-97	1993	1994	1995	1996	1997
BE	825	881	933	1,043	1,116	35%	836	881	933	1,043	1,116	33%	482	461	458	430	468	-3%	99	108	120	135	140
DK	522	543	563	584	583	12%	522	543	563	584	583	12%	25	20	12	13	10	-61%	n.a.	n.a.	n.a.	n.a.	n.a.
DE 2)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	552	582	910	982	1,038	88%	442	456	471	488	508	15%	n.a.	55	59	60	61
GR	n.a.	64	229	229	234	n.a.	107	103	136	246	293	173%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
ES 3)	833	818	810	845	910	9%	833	818	810	842	897	8%	-	-	-	-	-	-	n.a.	n.a.	n.a.	n.a.	n.a.
FR	378	395	420	466	515	36%	372	385	406	437	473	27%	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
IE	882	941	1,008	794	734	-17%	247	273	341	272	397	61%	246	232	242	227	258	5%	n.a.	n.a.	n.a.	n.a.	n.a.
IT	194	213	237	266	301	55%	280	313	351	393	426	52%	29	30	28	20	16	-44%	n.a.	n.a.	n.a.	n.a.	n.a.
LU	833	891	1,027	1,134	1,225	47%	988	1,044	1,183	1,286	1,387	40%	602	616	636	698	714	19%	n.a.	n.a.	n.a.	n.a.	n.a.
NL	857	909	1,062	1,219	1,540	80%	82	82	97	119	163	98%	117	84	47	38	26	-78%	n.a.	n.a.	n.a.	n.a.	n.a.
AT	406	437	478	510	576	42%	465	501	548	591	662	43%	300	289	294	294	303	1%	24	28	3	10	12
PT	486	536	634	708	818	68%	618	684	720	787	915	48%	53	55	57	66	53	0%	9	9	12	14	24
FI	792	830	864	930	1,002	26%	617	620	625	638	693	12%	2	1	1	1	1	-44%	337	339	342	308	308
SE	592	688	697	715	774	31%	1,309	1,375	535	636	691	-47%	-	-	-	-	-	-	913	1,039	n.a.	n.a.	n.a.
UK	1,289	1,324	1,431	1,514	1,641	27%	888	934	1,012	1,133	1,271	43%	756	780	821	862	903	19%	146	176	222	262	298
EU 1)	***558***	***567***	***621***	***670***	***741***	***33%***	***556***	***580***	***659***	***722***	***786***	***41%***	***296***	***369***	***330***	***340***	***354***	***19%***	***n.a.***	***n.a.***	***n.a.***	***n.a.***	***n.a.***

Source: European Monetary Institute, "Payment Systems in the European Union" (April 1996) and subsequent addenda (January 1997, January 1998), and the European Central Bank, "Payment Systems in the European Union, Addendum incorporating 1997 figures" (January 1999).

- "Nil"

1) Average without countries where data are not available.

2) Including bank customer cards.

3) Since 1995 a new source of data has been used and, therefore, some of the 1995 figures may differ from those contained in the "Addendum " (January 1997).

4) Cards issued by non-bank institutions to be used in specific stores. The card holder has usually a line of credit.

Table A.6

E-money loading machines, purchase terminals and cards (end of year) [1)]

	Electronic money cards (thousands)			Number of loading machines			Average value per (re)loading (ECU)			Number of purchase terminals			Average value per purchase (ECU)		
	1995	1996	1997	1995	1996	1997	1995	1996	1997	1995	1996	1997	1995	1996	1997
BE	30	761	3,430	311	1,425	6,438	33.3	33.7	32.1	1,196	5,504	21,263	4.9	4.1	3.9
DK	295	390	n.a.	2	2	3	136.5	135.9	n.a.	586	2,413	5,230	1.2	1.3	1.3
DE	n.a.	22,000	35,000	-	75	20,000	n.a.	67.4	n.a.	-	1,000	50,000	n.a.	13.6	10.3
GR [2)]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ES	n.a.	1,344	3,502	-	4,123	10,942	-	15.2	16.0	-	48,524	77,092	n.a.	5.8	3.1
FR	n.a.	n.a.	n.a.	-	n.a.	n.a.	-	n.a.	n.a.	-	n.a.	n.a.	-	-	-
IE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
IT	n.a.	n.a.	62	-	n.a.	945	n.a.	n.a.	n.a.	n.a.	n.a.	4,406	n.a.	n.a.	6.8
LU	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NL	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
AT	17	3,101	3,400	-	1,066	3,495	n.a.	45.8	49.9	-	3,333	12,756	n.a.	15.0	13.2
PT	161	299	384	5,484	7,622	5,129	14.1	15.3	16.1	30,760	55,646	63,703	1.9	1.9	1.9
FI [3)]	846	1,175	189	100	100	2,100	35.0	48.6	18.9	1,500	5,000	1,344	0.9	0.8	2.2
SE	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
UK	-	25	113	-	1,340	1,295	-	29.7	29.5	-	1,922	3,537	-	n.a.	n.a.
EU [4)]	***1,349***	***29,095***	***46,080***	***5,897***	***15,753***	***50,347***	***20.2***	***24.1***	***25.2***	***34,042***	***123,342***	***239,331***	***1.6***	***1.9***	***4.0***

Source: European Monetary Institute, "Payment Systems in the European Union" (April 1996) and subsequent addenda (January 1997, January 1998), and the European Central Bank, "Payment Systems in the European Union, Addendum incorporating 1997 figures" (January 1999).

- "Nil"

1) These data are partly extrapolated from regional pilot projects.

2) E-money schemes are in a pilot phase.

3) Figures for 1997 include only the new multipurpose card product that has replaced previous respective products.

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Table A.7

Number of bank staff per ECU 1 billion of assets

	1985	1990	1995	1996	1997	change 1985-95	change 1995-97	change 1996-97
BE	267	196	131	124	122	-51%	-6%	-1%
DK	316	224	174	149	135	-45%	-22%	-9%
DE	380	267	184	169	158	-52%	-14%	-6%
GR	886	764	627	574	511	-29%	-19%	-11%
ES	637	375	318	297	288	-50%	-10%	-3%
FR	347	213	155	144	134	-55%	-14%	-7%
IE	512	336	239	190	118	-53%	-51%	-38%
IT	491	292	287	240	219	-42%	-23%	-8%
LU	55	54	38	38	37	-30%	-3%	-2%
NL	456	275	186	176	155	-59%	-17%	-12%
AT	344	271	193	185	175	-44%	-9%	-5%
PT	1393	913	426	372	316	-69%	-26%	-15%
FI	929	453	327	297	271	-65%	-17%	-9%
SE	205	117	137	114	102	-33%	-26%	-10%
UK	388	294	186	171	144	-52%	-23%	-16%
EU [1)]	**507**	**336**	**241**	**216**	**192**	**-53%**	**-20%**	**-11%**

Source: The ECB publication "Possible effects of EMU on the EU banking systems in the medium to long term" (February 1999).

1) Unweighted average.

Table A.8

Number of bank staff per branch office

	1985	1990	1995	1996	1997	change 1985-95	change 1995-97	change 1996-97
BE	8	9	10	10	10	19%	5%	3%
DK	14	18	21	20	19	50%	-7%	-2%
DE	15	18	16	16	16	8%	2%	2%
GR	26	24	22	22	22	-13%	-3%	-2%
ES	8	7	7	7	6	-15%	-5%	-2%
FR	17	17	16	16	16	-3%	-1%	-1%
IE	17	18	22	21	19	25%	-10%	-9%
IT	24	19	15	14	14	-38%	-10%	-5%
LU	37	53	52	54	61	40%	17%	12%
NL	13	15	16	16	16	28%	1%	0%
AT	17	17	17	17	16	1%	-3%	-2%
PT	40	31	17	16	14	-56%	-16%	-9%
FI	11	17	16	16	16	53%	-1%	-1%
SE	12	14	17	17	17	40%	3%	-1%
UK	21	26	24	25	28	14%	17%	15%
EU [1)]	**19**	**20**	**19**	**19**	**20**	**4%**	**1%**	**2%**

Source: The ECB publication "Possible effects of EMU on the EU banking systems in the medium to long term" (February 1999).

1) Unweighted average.

Table A.9

Operating expenses as a percentage of non-bank deposits

	1990	1991	1992	1993	1994	1995	1996	1997	change 1990-97	change 1995-97	change 1996-97
BE	3.8%	3.6%	3.5%	3.8%	3.7%	3.5%	3.4%	3.2%	-16%	-10%	-6%
DK [1]	4.2%	5.0%	5.0%	4.3%	4.4%	4.2%	3.8%	3.6%	-14%	-13%	-6%
DE	3.1%	3.2%	3.2%	3.2%	3.2%	3.2%	3.1%	3.2%	2%	-1%	3%
GR [2]	2.7%	2.8%	2.7%	2.8%	3.2%	3.5%	3.6%	3.6%	31%	2%	0%
ES	4.4%	4.4%	4.4%	4.5%	4.1%	3.9%	3.8%	3.8%	-13%	-1%	0%
FR	6.8%	6.6%	6.6%	6.0%	5.7%	5.2%	5.0%	4.6%	-33%	-13%	-9%
IE						4.0%	3.8%	3.2%		-21%	-17%
IT [5]	5.6%	5.7%	6.2%	6.1%	6.1%	6.3%	4.9%	4.9%			0%
LU [2]	1.1%	1.1%	1.1%	1.0%	1.1%	1.2%	1.3%	1.3%	21%	4%	2%
NL	3.4%	3.6%	3.6%	3.9%	3.9%	4.0%	4.3%	4.5%	30%	11%	4%
AT	3.9%	3.9%	3.9%	3.8%	3.8%	4.4%	4.4%	4.4%	13%	0%	0%
PT [2]	3.5%	3.8%	3.9%	3.8%	3.7%	3.6%	3.6%	3.5%	0%	-3%	-2%
FI	5.5%	8.0%	11.0%	10.9%	8.6%	6.3%	5.3%	3.9%	-28%	-38%	-26%
SE [3]	6.2%	9.2%	12.8%	12.0%	6.2%	5.7%	5.0%	4.6%	-27%	-20%	-9%
UK	3.5%	3.7%	3.7%	3.8%	3.7%	3.6%	3.1%	3.0%	-15%	-16%	-4%
EU [4]	**4.1%**	**4.6%**	**5.1%**	**5.0%**	**4.4%**	**4.2%**	**3.9%**	**3.7%**	-11%	-12%	-6%

Source: OECD "Bank profitability" statistics. Staff costs include salaries and other employee benefits, including transfers to pension reserves.
Operating expenses include all expenses relating to ordinary and regular banking business other than interest expenses, fees and commissions payable and provisions and income or corporate taxes. Staff costs are a part of the operating expenses.

1) Commercial banks and savings banks.

2) Commercial banks.

3) Total commercial banks, foreign commercial banks, savings institutions and, until 1991, co-operative banks.

4) Unweighted average for the countries data are available.

5) Non-bank deposits for 1996-97 include bonds to take account of the subsitution effects of certificates of deposits for bonds due to legislation dated 20 June 1996.

Table A.10

Staff costs as a percentage of non-bank deposits

	1990	1991	1992	1993	1994	1995	1996	1997	change 1990-97	change 1995-97	change 1996-97
BE	1.9%	1.8%	1.8%	2.3%	2.3%	2.2%	2.0%	1.8%	-5%	-15%	-10%
DK [1]	2.6%	3.0%	3.0%	2.6%	2.7%	2.6%	2.3%	2.1%	-19%	-17%	-7%
DE	2.0%	2.0%	2.1%	1.9%	2.0%	2.0%	1.8%	1.9%	-5%	-3%	3%
GR [2]	2.1%	2.1%	2.0%	1.9%	2.3%	2.4%	2.5%	2.5%	18%	2%	0%
ES	2.8%	2.7%	2.7%	2.8%	2.5%	2.4%	2.4%	2.4%	-15%	-1%	0%
FR	3.7%	3.5%	3.5%	3.3%	3.1%	2.8%	2.7%	2.5%	-32%	-12%	-9%
IE						2.4%	2.2%	1.8%		-26%	-21%
IT [5]	3.7%	3.8%	4.0%	3.9%	4.0%	4.0%	3.2%	3.1%			-3%
LU [2]	0.6%	0.6%	0.6%	0.5%	0.6%	0.6%	0.6%	0.7%	16%	2%	2%
NL	2.0%	2.1%	2.1%	2.1%	2.2%	2.2%	2.3%	2.4%	21%	9%	4%
AT	2.3%	2.3%	2.3%	2.2%	2.2%	2.3%	2.3%	2.3%	0%	0%	0%
PT [2]	2.1%	2.2%	2.2%	2.1%	2.0%	2.0%	1.9%	1.9%	-9%	-3%	0%
FI	2.1%	2.2%	2.0%	1.9%	1.9%	1.5%	1.6%	1.2%	-44%	-23%	-27%
SE [3]	2.1%	2.1%	2.1%	1.9%	1.9%	2.2%	2.2%	2.2%	6%	0%	0%
UK	2.0%	2.0%	2.0%	2.1%	2.1%	2.0%	1.7%	1.6%	-18%	-18%	-4%
EU [4]	**2.3%**	**2.3%**	**2.3%**	**2.3%**	**2.3%**	**2.2%**	**2.1%**	**2.0%**	**-11%**	**-10%**	**-5%**

Source: OECD "Bank profitability" statistics. Staff costs include salaries and other employee benefits, including transfers to pension reserves. Operating expenses include all expenses relating to ordinary and regular banking business other than interest expenses, fees and commissions payable and provisions and income or corporate taxes. Staff costs are a part of the operating expenses.

1) Commercial banks and savings banks.

2) Commercial banks.

3) Total commercial banks, foreign commercial banks, savings institutions and, until 1991, co-operative banks.

4) Unweighted average for the countries data are available.

5) Non-bank deposits for 1996-97 include bonds to take account of the subsitution effects of certificates of deposits for bonds due to legislation dated 20 June 1996.

Table A.11

Operating expenses other than staff costs as a percentage of non-bank deposits

	1990	1991	1992	1993	1994	1995	1996	1997	change 1990-97	change 1995-97	change 1996-97
BE	1.9%	1.8%	1.7%	1.5%	1.5%	1.4%	1.3%	1.4%	-27%	-2%	1%
DK [1]	1.6%	2.0%	1.9%	1.7%	1.7%	1.6%	1.6%	1.5%	-6%	-7%	-3%
DE	1.1%	1.2%	1.2%	1.2%	1.3%	1.3%	1.3%	1.3%	14%	1%	3%
GR [2]	0.6%	0.7%	0.8%	0.8%	1.0%	1.1%	1.1%	1.1%	75%	4%	0%
ES	1.7%	1.7%	1.7%	1.7%	1.6%	1.5%	1.5%	1.5%	-11%	-1%	0%
FR	3.2%	3.1%	3.1%	2.7%	2.6%	2.4%	2.3%	2.1%	-35%	-14%	-10%
IE						1.7%	1.6%	1.4%		-15%	-11%
IT [5]	1.9%	2.0%	2.2%	2.2%	2.1%	2.3%	1.7%	1.8%			6%
LU [2]	0.5%	0.5%	0.5%	0.5%	0.5%	0.6%	0.6%	0.6%	26%	7%	3%
NL	1.5%	1.5%	1.5%	1.7%	1.8%	1.8%	2.0%	2.1%	42%	15%	4%
AT	1.6%	1.6%	1.6%	1.5%	1.5%	2.1%	2.1%	2.1%	32%	1%	0%
PT [2]	1.3%	1.6%	1.7%	1.7%	1.6%	1.6%	1.6%	1.5%	15%	-3%	-5%
FI	3.4%	5.9%	9.0%	9.0%	6.7%	4.8%	3.7%	2.8%	-19%	-42%	-26%
SE [3]	4.1%	7.2%	10.7%	10.1%	4.2%	3.5%	2.8%	2.3%	-43%	-33%	-17%
UK	1.5%	1.6%	1.7%	1.7%	1.6%	1.6%	1.4%	1.4%	-10%	-14%	-4%
EU [4]	**1.8%**	**2.3%**	**2.8%**	**2.7%**	**2.1%**	**1.9%**	**1.8%**	**1.7%**	**-10%**	**-15%**	**-7%**

Source: OECD "Bank profitability" statistics. Staff costs include salaries and other employee benefits, including transfers to pension reserves.
Operating expenses include all expenses relating to ordinary and regular banking business other than interest expenses, fees and commissions payable and provisions and income or corporate taxes. Staff costs are a part of the operating expenses.

1) Commercial banks and savings banks.

2) Commercial banks.

3) Total commercial banks, foreign commercial banks, savings institutions and, until 1991, co-operative banks.

4) Unweighted average for the countries data are available.

5) Non-bank deposits for 1996-97 include bonds to take account of the subsitution effects of certificates of deposits for bonds due to legislation dated 20 June 1996.

Table A.12

Staff costs as a percentage of operating expenses

	1990	1991	1992	1993	1994	1995	1996	1997	change 1990-97	change 1995-97	change 1996-97
BE	51%	51%	51%	61%	61%	61%	60%	57%	13%	-6%	-5%
DK [1]	62%	60%	61%	61%	62%	61%	60%	59%	-6%	-4%	-2%
DE	64%	63%	63%	61%	61%	60%	59%	59%	-7%	-2%	0%
GR [2]	77%	76%	72%	69%	70%	70%	69%	69%	-10%	-1%	0%
ES	62%	61%	61%	62%	61%	61%	61%	61%	-2%	0%	0%
FR	54%	53%	53%	55%	54%	54%	54%	55%	2%	1%	1%
IE						59%	58%	55%		-6%	-5%
IT	66%	65%	64%	63%	65%	64%	65%	63%	-5%	-2%	-3%
LU [2]	52%	52%	52%	51%	53%	51%	50%	50%	-4%	-2%	0%
NL	58%	58%	58%	55%	55%	55%	54%	54%	-7%	-2%	0%
AT	59%	59%	60%	59%	59%	53%	53%	53%	-11%	0%	0%
PT [2]	62%	59%	57%	56%	56%	56%	54%	56%	-9%	0%	3%
FI	39%	27%	18%	18%	22%	24%	30%	30%	-22%	23%	-1%
SE [3]	33%	22%	17%	16%	31%	39%	44%	48%	45%	25%	10%
UK	57%	55%	55%	55%	56%	56%	55%	55%	-4%	-2%	0%
EU [4]	**57%**	**54%**	**53%**	**53%**	**55%**	**55%**	**55%**	**55%**	**-3%**	**0%**	**0%**

Source: OECD "Bank profitability" statistics. Staff costs include salaries and other employee benefits, including transfers to pension reserves. Operating expenses include all expenses relating to ordinary and regular banking business other than interest expenses, fees and commissions payable and provisions and income or corporate taxes. Staff costs are a part of the operating expenses.

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