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Research Department
30.6.2000

Surveys on Electronic Money

SUOMEN PANKIN KESKUSTELUALOITTEITA • FINLANDS BANKS DISKUSSIONSUNDERLAG

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The views expressed are those of the authors and do not necessarily correspond to the views of the Bank of Finland

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Abstract

This paper investigates the views of electronic money operators and innovators on the possibilities and implications of e-money, especially with respect to replacing central bank money as well as technical issues regarding e-money, its implications for the financial industry and central banking. This has been done using surveys of major e-money innovators and operators, based on the assumption that these operators and innovators are likely to shape the future framework for e-money schemes. It seems that innovators and operators are quite confident about the future of e-money – despite problems and obstacles surrounding current testing – and that central banks' monopoly of the issuance of money as a medium of exchange will no longer be unchallenged.

Key words: electronic money, financial regulation, central banks, financial innovation

Kyselytutkimuksia elektronisesta rahasta

Suomen Pankin keskustelualoitteita 7/2000

Yuksel Gormez – Forrest Capie
Tutkimusosasto

Tiivistelmä

Selvityksessä tarkastellaan käsityksiä, joita palvelutarjoajilla ja innovaattoreilla on elektronisen rahan mahdollisuuksista ja vaikutuksista, etenkin koskien käteisrahan tulevaisuutta, erilaisia teknisiä kysymyksiä sekä elektronisen rahan merkitystä rahoitustoimialan ja keskuspankkitoiminnan kannalta. Selvitys perustuu haastattelututkimuksiin, joiden kohteena olivat tärkeimpien elektronisen rahan alalla toimivien yritysten edustajat, koska näiden yritysten voidaan olettaa muovaavan elektronisten rahajärjestelmien tulevaisuutta. Näyttää siltä, että innovaattorit ja operaattorit suhtautuvat varsin luottavaisesti elektronisen rahan tulevaisuuteen, huolimatta ongelmista ja vaikeuksista nykyisissä kokeiluissa, ja että keskuspankkien monopoli maksuvälineenä käyvän käteisen tarjonnassa ei enää ole selviö.

Asiasanat: elektroninen raha, rahoitusmarkkinoiden sääntely, keskuspankki, rahoitusinnovaatiot

Contents

1 Introduction

As a financial innovation, electronic money (e-money) has captured the attention of central banks, financial regulators, law enforcement agencies, financial practitioners and academics alike. The US Department of the Treasury (1996) included e-money and electronic payment systems for retail transactions on the list of the ten most important issues for those significantly concerned with financial services. As e-money schemes emerge around the world, central banks are actively publishing articles on e-money issues (BIS, 1996A; 1996B, 1998; ECB, 1998) and trying to enunciate the policy implications.

The emergence of e-money has been discussed not only by central bankers but also by financial and non-financial institutions, including law enforcement agents, especially with regard to the implications and possibilities. Some of the specific concerns for public policy authorities are consumer protection, financial system stability, monetary policy and the seigniorage implications of e-money development (eg BIS, 1996B).

It is hardly surprising anymore to hear about new trials in new countries or cities (involving the same or different e-money schemes). Although there is no generally-agreed business case for any particular e-money scheme, operators and innovators have been trying to establish national and international standards for e-money products, using a wide variety of approaches (from account-based payment solutions to totally anonymous token-based payments), and have invested large sums of money, time and effort. A survey of current or planned e-money products in 68 countries/territories has recently been made available to the public by the Bank for International Settlement (BIS, 2000).

As an emerging technology, e-money seems to have been moving very fast. A few years ago, expectations as to network-based e-money tended to be exaggerated. The early proposals were impressive, in line with popular expectations regarding Internet and network-based virtual life. In the following years, smart card-based solutions to e-money applications became very popular, and nearly all credit companies began to invest in electronic purse technology, parallel to independent start-ups. There were even forecasts of person-to-person transactions via electronic wallets that would be distributed to all card holders. Recently, mobile applications have favoured network and card-based e-money schemes in connection with WAP (Wireless Applications Protocol) applications, which is another type of card-based solution, since WAP is written on smart cards. In this rapidly and continuously changing environment, the survey approach seems to provide the best means of collecting data on the implications and possibilities of e-money.

This paper is based on two recent surveys[1] conducted in two commercial smart card exhibitions. For the contents of the surveys, electronic money has been treated as a phenomenon, and it was assumed that the survey approach would be

[1] These surveys are a part of a PhD Research project at City University Business School, London. The analysis of the first survey was presented as ”Capie, F.H. – Gormez, Y. – Stojanovic, A.: *Electronic Money: The Perception of Operators and Innovators*. At the 8th Symposium on Finance, Banking, and Insurance, Universität Karlsruhe (TH), Germany, December 15–17, 1999” and the analysis of the second survey was presented as ”Capie, F.H. – Gormez, Y.: *A Survey on Electronic Money Trends in 2000*. At the Third Berlin Internet Economics Workshop, Berlecon Research, Berlin, Germany, May 26–27, 2000”.

the best way to collect data in order to gain insights into the future of this presumed phenomenon, meaningful time series data being almost totally unavailable because of the infancy of e-money. As a result, the paper is mainly exploratory. The first data set was collected in 1999 and is analysed in section 2, and the second data set, which is from the second survey (2000) is analysed in the section 3. Both data sets were collected from the same venue but in different (two consecutive) years.[2]

It is clear that innovators and operators are at the forefront of e-money development, conceiving and offering new ideas and products to investors and the market at large. Therefore, their views on the potential of e-money and its impact are uniquely interesting for policy makers. Of course, innovators and operators cannot exactly predict how the future of e-money will turn out, but they do have a lot of special knowledge on the possibilities their products and ideas make available for the society as a whole.

The selection of venue was based on the belief that the future of electronic money is likely to be shaped by the new technologies and their applications. The innovators develop the technologies and the e-money scheme operators design the applications, and thus both groups were represented in the surveys. The exhibitions brought the groups together in a presentation of their products and visions of e-money applications. Consequently, the scope of the analysis is limited to the perceptions of innovators and operators regarding e-money; the views of other interest groups are excluded from the study.

The common purpose of the two surveys was to collect empirical data on the current status of e-money schemes and to investigate future trends, interesting to central bankers, regulators and practitioners who are shaping their approach to e-money and its implications for the financial services industry, including the monetary policy and financial regulation aspects. The study is not intended to provide detailed information on any particular e-money scheme nor on the advantages or disadvantages of particular proposals. Nor is this an analysis of a particular country's vision of the e-money phenomenon. The aim was to collect data that may help to understand the possibilities and limitations of e-money in general, so as to assist policy makers to decide on policies that may have direct or indirect consequences for the development of e- money.

In this paper, e-money is understood in a broad sense as by the European Central Bank (ECB), ie as "an electronic store of monetary value on a technical device that may be widely used for making payments to undertakings other than the issuer without necessarily involving bank accounts in the transaction, but acting as a prepaid bearer instrument" (ECB 1998, p. 7). This definition covers the following aspects of e-money: It is a prepaid bearer instrument, which excludes all kinds of electronic payment instruments such as credit and debit cards and EFT payments. It covers payments to undertakings other than the issuer, which is a required in order to differentiate e-money products from single purpose prepaid cards such as telephone cards. Transactions do not necessarily require a bank account or authorisation of any other financial service provider. E-money stores monetary value on a technical device that can be used widely for making payments. The definition does not specify the type of technical device, which is a practical necessity since it is in an emerging stage and the technical possibilities of proposed devices are not yet obvious. However, technological developments

[2] Questionnaires for both surveys are presented as appendices.

relating to e-money products should be followed carefully, as these may still have an influence on the above definition, since an unexpected innovation could change some of the basic concepts relating to e-money. Relying on any specific definition may even be misleading, due to continuously emerging technological opportunities to adopt new applications for the electronic medium of exchange.

2 Electronic money survey: 1999

The first data set will be analysed in this section of the paper. The data was collected in 1999 during the 12th International Advanced Card Exhibition and Conference (Smart99cards), which was held in Olimpia 2 in London on 23–25 March 1999. The questionnaire for the survey is presented in the appendix 1.

2.1 Introduction and aims of the survey

One aim of the first survey was to provide empirical insights into what e-money innovators and e-money scheme operators driving the innovation and technological developments think about the issues surrounding e-money.

The second aim was to scrutinise some of the issues of concern to the parties that take part in e-money implementation, analysis and discussions. The broader aim was to gather information from industry experts and use it to gain insights that will help decision-makers and other discussants from both academia and the practical world to understand e-money and its potentials and limitations.

Consequently, detailed analyses of particular products or schemes are beyond the scope of the study. The data collection was not designed for this purpose, which would be better served by a case study. Moreover, it is not the aim here to compare different e-money schemes or to clarify differences in various concepts of e-money.

2.2 The survey sample

The questionnaire was prepared and a survey was conducted at the Smart99cards Exhibition and Conference. Open systems and multi-applications were key concepts at the exhibition, not only for card manufacturers but also for system operators and users. Almost all e-money scheme operators – some with similar and some with widely differing approaches to e-money applications – participated in the exhibition. Projects involving person-to-person applications were presented along with projects with account-based solutions. There were companies that were attempting to unite several e-money applications in a single and compatible platform and companies with operating system proposals for potential e-money software. Most of the major innovators in e-money technology from around the world participated in the exhibition. The topics ranged from biometrics solutions to advanced cryptography. The majority of represented companies were interested in certain aspects of smart card technology, but the main players were also

concerned with defining their approaches to current problems and sharing their visions with interested parties. The total number of exhibitors was just over 120.

It can be argued that the survey sample, which included almost all relevant exhibitors, was representative and had good-to-excellent coverage on emerging e-money technologies, since all the main players were there long enough to provide the appropriate environment for a survey.

2.3 Methodology and data collection

The questionnaire was distributed to the individual exhibit stands on the second and third days of the exhibition. The distribution process included an interview of the exhibitor concerning its products and services. Those exhibitors with products and services unrelated to electronic money (eg companies involved in the manufacturing process but not in financial applications) were not given a questionnaire. Potential respondents were informed of the aims of the survey, including general information about the research project. In all, 105 questionnaires were distributed and 51 were later collected, so that the return rate was 49 %. (Due to the hectic circumstances, many exhibitors lost their questionnaires and were given second copies. In calculating the rate of return, lost questionnaires were excluded from the total count so as to avoid double counting). There were some exhibitors who refused to complete questionnaires while other non-responses were mostly due to a lack of available staff or requisite expertise (as most of them explained it)[3].

2.4 Survey results

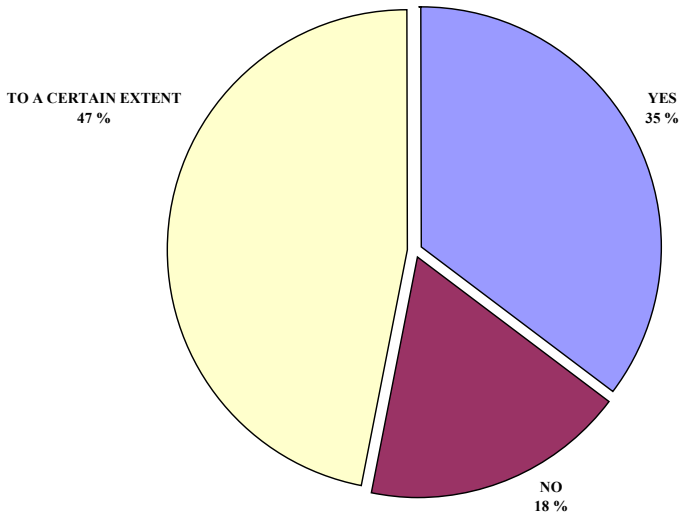
The questionnaire comprised eleven questions, each with a section for comments. Central to the questionnaire were central banking-related issues, such as the outlook for regulation. The implications of regulatory proposals on innovation and competition were also investigated. The technological limits and obstacles as well as the possibilities for e-money innovation – such as the future base for e-money access – were also included in the questionnaire. Finally, queries were also made on future trends in light of these obstacles and possibilities, as eg the implications of e-money products for the banking industry.

The first question on the questionnaire was "Do you think that electronic cash has a potential to replace central bank money?". The aim of the question was to ascertain whether e-money technology is perceived as sufficiently mature to replace currency (banknotes and coins) in circulation produced and managed by central banks and treasuries, since this would have implications for both the

[3] Collection of the questionnaires took place on the second and third days of the exhibition. Longer interviews were conducted with e-money operators and influential innovators (eg the major smart card providers) on an individual basis in order to gain additional insights into current and future projects. The exhibition also enabled visitors to view the latest developments such as mobile phones that can read smart cards and execute financial transactions on a real-time basis. (These mobile phones are like card readers with dual bands and are capable of executing financial transactions). Another exhibit was on the integration of smart card readers and PCs, which enables interoperability of conventional and virtual payment systems. When mature, all PCs may be able to execute financial transactions with guaranteed security.

privatisation of seigniorage revenues and for the conduct of monetary policy. Further, the views expressed on e-money can be defended only if the technology has the potential to provide a permanent replacement for banknotes and coins. Otherwise, e-money may warrant analysis merely as another complementary innovation in advanced payment systems, which have been developing rapidly, especially since 1980, due to advances in credit and debit card applications. The responses are summarised in the chart 2.1.

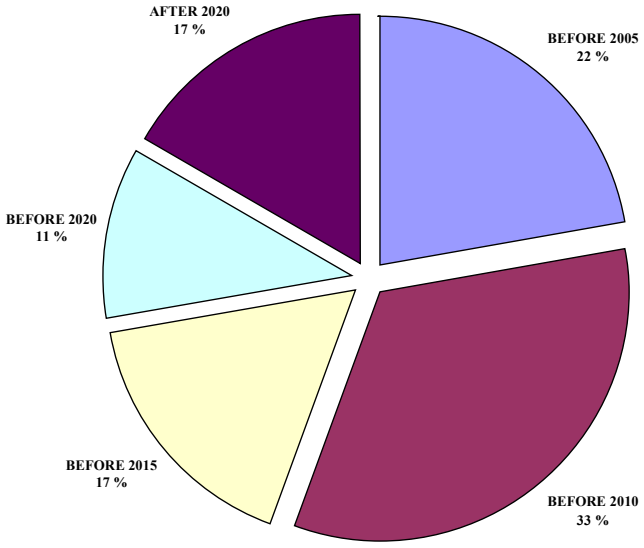
Chart 2.1 **Can e-money replace central bank money?**



It seems clear that the majority of the respondents believed in the possibility of e-money replacing currency in circulation. Only 18 % felt that e-money could not replace central bank money, whereas 82 % felt that it could do so, albeit 47 % to only a certain extent. Even excluding the "To a certain extent" option, believers in the potential of e-money technology to eliminate banknotes and coins surpassed non-believers by 17 %. There were no "Don't know" responses. It seems that the sample selection for the questionnaire was appropriate for collecting data on e-money, as all the respondents confirmed that they were sufficiently familiar with e-money to give reasoned responses to the questions. There were comments on issues of concern to elderly people and children and on issues such as marketing the e-money concept in order to create a critical mass of users. These are serious matters among those concerned with e-money. Some argue that even with the appropriate technology for replacing central bank money, there could be social barriers to a complete changeover.

In connection with the first question, it was asked "If yes, when?". 35 % of those who said "Yes" to the first question gave their responses. The aim here was to ascertain the expected time needed for e-money technologies to replace banknotes and coins and to determine whether central banks and regulators should take time to analyse e-money products or should try to decide now on their roles and functions. The responses should provide insight on the time-frame for policy action. The results are shown in chart 2.2.

Chart 2.2 **If e-cash can replace CB money, when?**

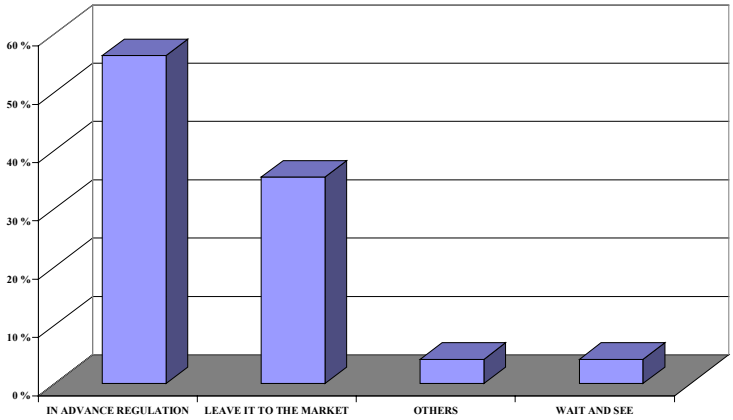


Note that more than half of the respondents (55 %) who felt that e-money has the potential to replace central bank (CB) money also felt that this will take place before 2010. The chart also shows that those respondents who anticipated the total replacement of currency in circulation by e-money believed this would happen sooner rather than later. Only 17 % indicated that replacement of CB money would be realised after 2020.

According to the results, policy makers concerned with e-money, including central banks and regulatory bodies, should decide soon on appropriate policies in order not to lag behind the curve of technological progress. Time may be a critical factor for the effectiveness of a policy measure. One important aspect of the elimination of banknotes and coins is that this is a once-for-all matter since, once the technology is capable of circulating money electronically, the circulation could continue to be electronically based even in the event that the denomination of the currency is changed. Moreover, central banks' control over money increased in the early 19th century, and over a period of many years financial markets became accustomed to this notion. Keeping this in mind, even a 20-year period for the elimination of currency may not be regarded as a "long time".

The next question regarding central banking issues concerned the desired reaction of central banks to e-money developments. The aim was to determine innovators' and operators' demands on the regulatory authorities in general and on central banks in particular as regards the regulation of e-money. Chart 2.3 illustrates the results.

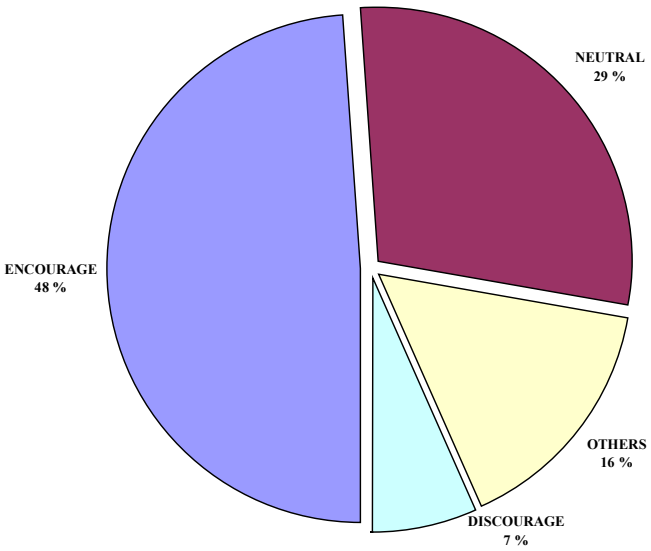
Chart 2.3 **What should be the reaction of central banks to e-cash?**



Interestingly, a majority of respondents called for in-advance regulation of e-money by central banks, whereas a "wait and see" policy was mentioned only as often as "other" proposals, ie "getting involved in the discussions" and "analysis of e-money products". The clear preference for regulation of e-money may be explained by uncertainty about the future of e-money products and the fact that innovators and operators may be expecting central bank regulation as an alternative to common standards, which would be necessary for world-wide success of a particular scheme. Because so many different proposals for e-money schemes have been developed and because there are already more than three different operating systems for using smart cards in a launch of e-money, the questionnaire result may also be taken as a call for centralised regulation that would guide future e-money developments. Any kind of incentive (incl. central bank regulation) that sets standards for launches would eliminate the risk of investing in a non-dominant technology.

There were two other questions concerning regulatory issues. The aim was to ascertain the reaction of innovators and regulators to European Central Bank regulatory proposals (ECB, 1998) on innovation and competition. As it is generally believed that there is a negative correlation between regulation and innovation, the intention was to determine whether regulation was regarded by innovators and operators as a barrier to further innovation and whether it was regarded as anti-competitive. Chart 2.4 summarises the implications for innovation.

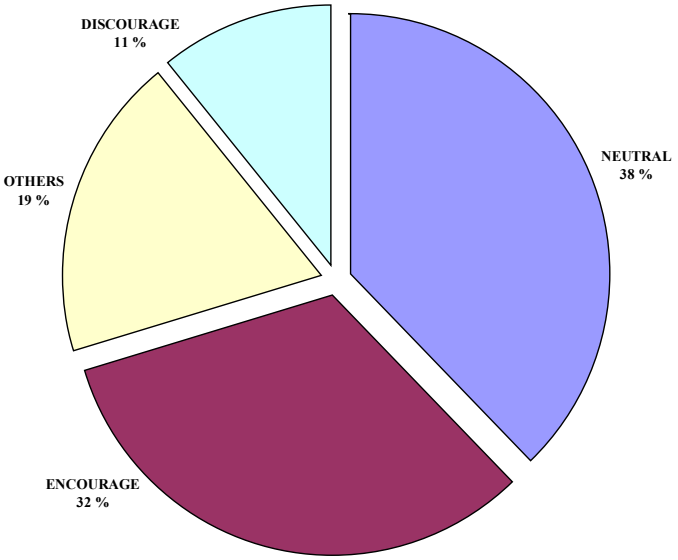
Chart 2.4 **Innovation implications of ECB proposals on the regulation of e-money**



Note that almost half of the innovators and operators seemed to favour regulation, as they did not regard it as a disincentive for innovation. At the same time, 29 % viewed ECB proposals as neutral for innovation and only 7 % believed the proposals would discourage innovation. Those who were not familiar with the ECB proposals marked the "others" option (16 %).

The results for the competition implications of ECB regulatory proposals are shown in chart 2.5.

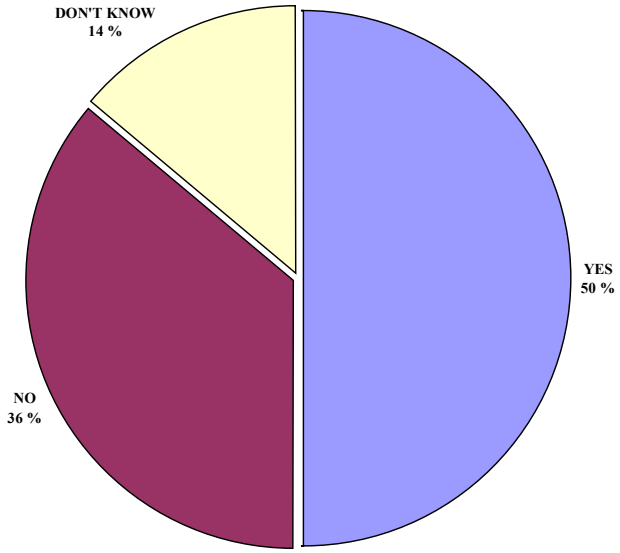
Chart 2.5 **Competition implications of ECB proposals on the regulation of e-money**



Here, 38 % believed that the competition implications of the ECB proposals would be neutral, 32 % thought that proposals would encourage competition, and 19 % indicated no opinion on the proposals. Only 11 % anticipated that regulation would discourage competition. Responses to these last two questions seemed consistent with the ECB view that in-advance regulation may contribute both to innovation and to competition in connection with e-money products, since it would remove uncertainties about the future potential of e-money products (ECB 1998). The results also appear to be consistent with chart 2.3, as it indicated that the majority of participants clearly preferred in-advance regulation of e-money.

The next question dealt with the problem of whether non-financial institutions should be allowed to issue e-money. The aim of the question was to ascertain whether e-money may also be issued eg by telecommunications companies. The results are shown in chart 2.6.

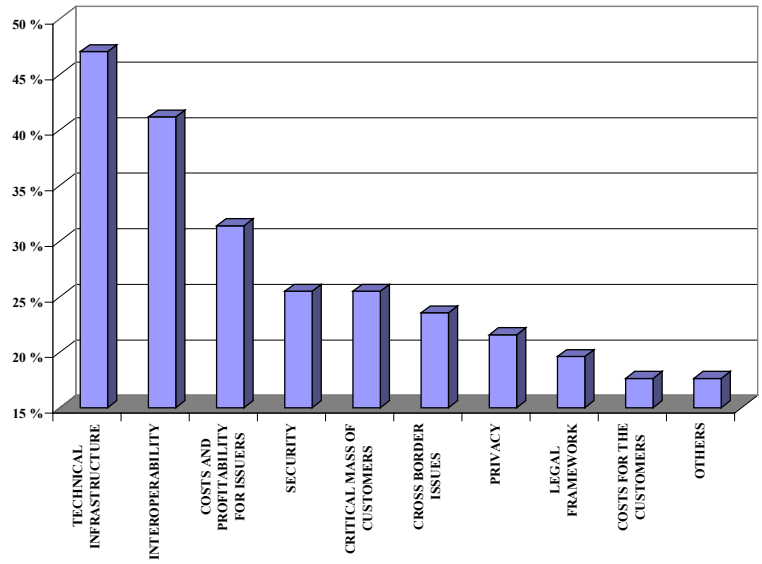
Chart 2.6 **Should non-bank institutions be allowed to issue e-money?**



As the chart shows, the majority were in favour of allowing non-financial institutions to issue e-money; only 36 % opposed the idea. Although ECB proposals on regulation of e-money were favoured in respect of innovation and competition, the tendency to eliminate non-banks seems not to be supported by innovators and operators. They apparently prefer regulation as guidance rather than as a set of restrictive rules.

The next question was about obstacles to wide acceptance of e-cash as a replacement for central bank money. The aim of the question was to determine the kinds of problems that have so far limited, and would in the future limit, potential technical solutions from turning into practical total solutions. Chart 2.7 shows the results.

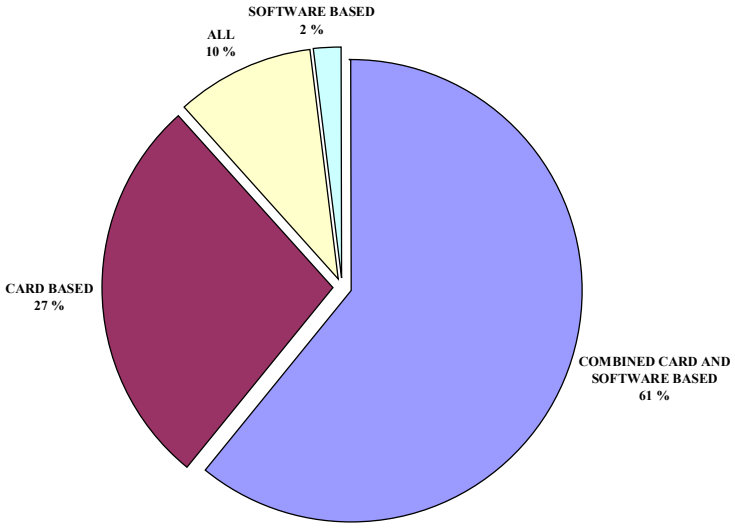
Chart 2.7 **Main obstacles for e-cash to replace CB money**



The required technical infrastructure, including retailer readers, customer cards and software, was mentioned as the leading obstacle for e-money to replace CB money by almost half of the respondents (47 %). Interoperability of different e-money schemes was the second most frequently mentioned obstacle, and most of respondents mentioned the success of GSM technology in mobile phones in that it enabled a common world-wide platform for mobile systems. Interoperability is also a big issue for alternative operating systems. Issuers' costs and profitability was the third obstacle, and it may be argued that because there is as yet no proven business case for e-money, the innovators and operators still see profitability as an obstacle. Interestingly, not many of the respondents mentioned security and privacy as major obstacles (25 % and 22 % respectively). Whereas it is not unreasonable that security would not be rated high in importance because of confidence in secure solutions, privacy seems to be somewhat undervalued. The legal framework was also given low priority, which may be another indication in favour of the regulatory approach to e-money issues. It may be argued that innovators and operators look for some kind of guidance in resolving their conflicts and rely on regulation as a common ground because, on one hand, they favour in-advance regulation (chart 2.3) and do not think ECB regulations impose a negative impact on innovation and competition (charts 2.4 and 2.5) while, on the other hand, they do not think that a legal framework is a serious obstacle to e-money schemes.

Another question concerning future prospects for e-money was about the future base for e-money schemes. There are three essentially different proposals for the base for e-money that can be supported by an operating system: card-based, software-based or a combination of the two. The results are shown in chart 2.8.

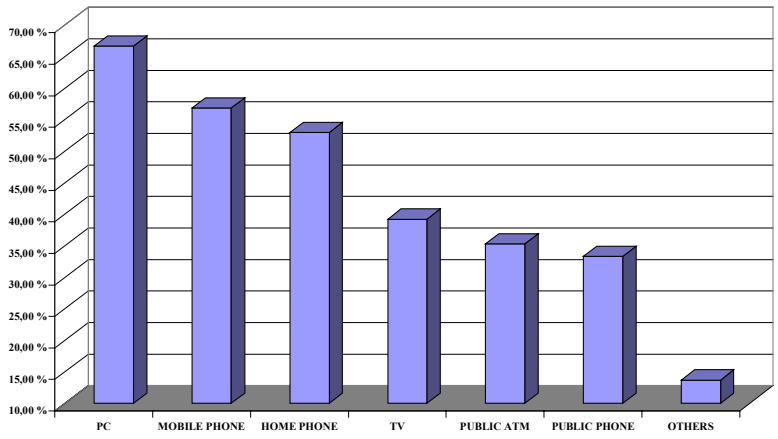
Chart 2.8 **Future base for e-money schemes**



According to the results, 61 % felt that the future base for e-money schemes would be a combination of card- and software-based products that can be used both in conventional transactions and in e-commerce. This result seems consistent with current market trends since, in all card-based solutions, network connections have been adapted to e-money schemes and network-based proposals seem to entail commercial problems, at least as regards the earliest versions of e-money schemes. The card-based option was supported by 27 % and only 2 % favoured software-based products. One of the important aspects of the multi-application potential of chip cards is that they are suitable to develop the critical mass necessary to solve the chicken-egg problem for e-money schemes. As every card application could increase the number of cards in circulation, the purse application may be supported by the existence of an appropriate infrastructure. However, according to the survey results, the respondents expect that there will be a common solution for transaction requirements in conventional and virtual lives, ie for both traditional and electronic commerce. This result underlines the significance of smart cards, as they seem to be the only technical product that can support a card- and software-based solution due to their individual features and network adaptability. Of all respondents, 10 % thought that three different solutions might continue to exist side by side, which indeed seems a possibility since this would address the needs of different segments within the interactive groups via international, national and local electronic trading systems.

The next question is about another critical problem concerning e-money schemes, ie the future access medium. The aim of the question was to find potential distribution channels for e-money in financial transactions, including activities such as downloading purchasing power from a financial service provider's account into a chip card, etc. The results should provide guidance to decision makers as to which technology they should concentrate on in their policy reactions. The result is displayed in chart 2.9.

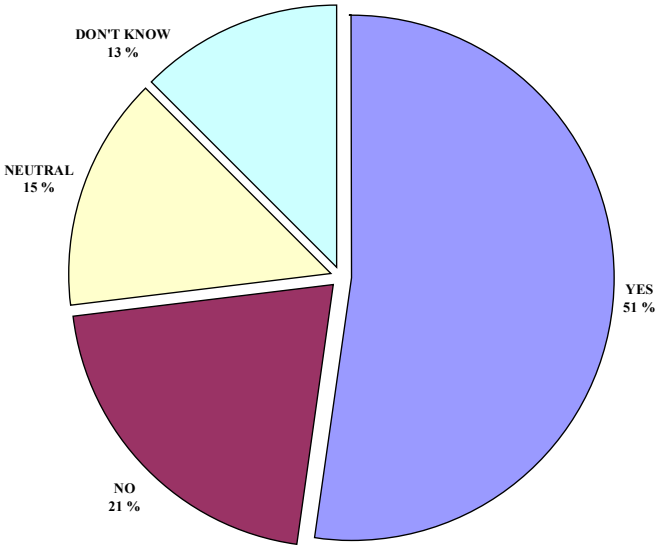
Chart 2.9 **Access medium for e-money in the future**



The PC was the favoured access medium for the future, chosen by 67 % of respondents, and mobile phones ranked second at 57 %. Third was the home phone (53 %), followed by TV, public ATM and public phone. The preference for the PC seemed consistent with the anticipated future base for e-money schemes, as it can be used for both card and software-based e-money schemes. TV is probably ranked high because it is anticipated that digital TV technology will bring new opportunities in connection with e-commerce. These responses are important to central banks because the top four choices are not among the common cash access media in current banking practice. This may be an indication that the financial service industry could change profoundly from the traditional distribution of currency via bank branches, ATMs and retailer cash-backs to electronic circulation of monetary value via PCs, phones and digital TVs, which would obviate the need for physical cash. Once money can be circulated electronically via the latter media, electronification of financial services as a whole may be accelerated, which would have broad implications, ranging across the monetary transmission mechanism to seigniorage and across free banking to competing currencies.

The purpose of the next question was to determine whether e-money technology could reduce barriers to entry to the financial service industry. These barriers affect provision of new financial services by financial institutions as well as provision of financial services by non-financial firms. The question is intended to cover both, with emphasis on the latter development, especially as regards payment services.

Chart 2.10 **Can e-money decrease barriers to entry to the banking industry?**

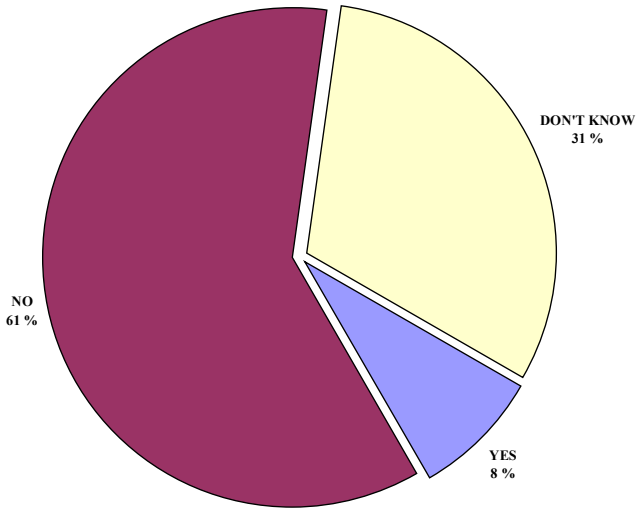


As chart 2.10 shows, a majority (51 %) believed that e-money technology will reduce barriers to entry. Only 21 % thought it will not do so, while 15 % anticipated a neutral effect and 13 % said they did not know. If the results are accurate, they may have implications not only for regulation of e-money but also for regulation of the whole financial system, as they raise questions about special treatment of banks vs other firms in the economy. The results confirm that e-money technology will increase competition in the financial services industry. The general feeling is that competition increases market efficiency. It may be necessary to evaluate financial services as to exactly who should be licensed to provide these services so as to ensure productivity, efficiency and stability.

The last question was about the privatisation of money. It may be argued that it is generally expected that the introduction of e-money will reduce handling costs of money as a medium of exchange and hence, if security can be ensured, then there may be a case for privatisation of money.[4] It may also be argued that e-money developments have stimulated increased analysis of unregulated banking experiences around the world from a historical perspective, since it apparently enables a technical and informative infrastructure for issuing private money. Privatisation of money in this context, in its simplest form, is defined as the process of eliminating the central bank monopoly on money and transferring the issuance, circulation and quality management of money to private hands, preferably on a competitive basis. The aim of the question was to investigate the exact stance of innovators and operators on the question of private money. Responses to the question are shown in chart 2.11.

[4] Hayek (1990) and Dowd (1996) investigated the concept of private money in depth.

Chart 2.11 **Should money be privatised?**



With a majority of 61 %, the innovators and operators opposed the privatisation of money. Note that "don't know" responses amounted to 31 %, ie almost a third of the respondents preferred to stay out of the discussion. But 8 % favoured the privatisation of money. This seemingly small percentage could be quite significant, in light of the fact that privatisation of money would constitute a big change from a status quo situation going back many years. It may be argued that the primacy of central bank money is no longer a truism.

2.5 Conclusions and recommendations

The survey confirms that central banks and regulatory bodies have been on the right track in exploring the potential of e-money to replace their own monies. Charts 2.1 and 2.2 suggest that innovators and operators are of this opinion. Moreover, central banks are expected by innovators and operators to regulate e-money business in advance, probably in order to establish a well-defined regulatory environment for continuously changing business structures and proposals (chart 2.3).

The pronounced demand for regulation may be explained by the fact that GSM seems to have been successful in providing a standard for mobile phones, as it has enabled the development of a critical mass and has solved the chicken-egg problem already during the initial launches. Innovators and operators did not regard European Central Bank proposals on e-money as an impediment to innovation in e-money technology nor to competition among different operators (charts 2.4 and 2.5).

Concerning the privatisation of money, it may seem that the majority rejected the idea. However, the monopoly of central banks in issuing money as a medium of exchange did not go unchallenged (chart 2.11).

Responses to questions about the implications of e-money for the banking industry indicated that innovators and operators contest the banks' right to

monopolise the e-money business (chart 2.6) and feel that e-money technology will reduce barriers to entry to the banking industry (chart 2.10).

Innovators and operators nearly agreed on a combined card and software base as the e-money infrastructure for the future (chart 2.8). This is in line with the anticipated wider acceptance and use of e-money and the need for a payment medium that will be a part of the new, developing lifestyle, whereby e-commerce and PC banking are interconnected with conventional commerce and personal finance. The need for integration of a payment medium (eg e-money) with the new commercial and financial landscape is further emphasised by the favoured access media for e-money (chart 2.9). It is not impossible to envisage a "network" of interoperable PCs, mobile and fixed-line phones, digital TVs and ATMs that serve as a platform for retail payments, at customers' convenience. Provision of payment and settlement services is where financial institutions have the advantage over the new challengers but, at the same time, commoditisation of these services may lead to the demise of banks as the service providers.

The main obstacles to e-money replacing central bank money were seen as problems in technical infrastructure, interoperability, and costs and profitability for issuers (chart 2.7). It is obvious that the innovators and operators gave priority to "technological and operational" issues, believing that the broader economic and social considerations will eventually fall into place. This may reflect a professional bias, but it may also indicate the confidence of innovators and operators in the realisation of secure and "privacy-protected" e-money.

3 Electronic money survey: 2000

We turn now to the second survey, which was conducted about a year later in 2000, at the 13th International Advanced Card Exhibition and Conference (Smartcard2000), which was held in Olimpia 2 in London on 8–10 February 2000, the same venue where the first survey was conducted. As the previous year's survey provided a very useful set of data, the same venue was used a year later in order to extend the understanding of current trends in e-money developments with additional questions. It was not intended to collect comparative data in order to see what might have changed in the interim since it was considered more useful to extend the coverage of the surveys as extensively as possible using a different set of questions. The relationships between the results of the two surveys will be discussed in the last section of this paper.

3.1 Aims of the survey

The aims of the second survey were first to deepen empirical insights into what e-money innovators and scheme operators driving the innovation and technological development think about the issues concerning e-money (eg the preferred operating system for card-based solutions) and technical issues surrounding the current stage of e-money technology.

The second aim was to discover the current expectations of innovators and operators concerning the possibilities and impacts of e-money for the future of the financial service industry and financial service providers. Questions in this section

are intended to show how e-money may influence eg the dominance of banks in the provision of financial services.

The third aim of the survey was to investigate future capabilities of e-money technology regarding the future of central banking as well as innovators' and operators' expectations about the possibilities for e-money and the implications of those possibilities for the future of central banking.

The overall aim was the same as that of the first survey, ie to gather information from industry experts and use this information to gain insights that will aid decision-makers and discussants (both academics and practitioners) in understanding e-money and its potential and limits. An important limitation of both surveys is that they are concept- rather than product-oriented. They do not analyse any particular proposals or schemes or compare them in terms of advantages and disadvantages. E-money is taken here as an emerging phenomenon, and it is assumed that anyone with an interest in the financial industry will need to understand its pros and cons. Instead of relying on case studies of different proposals and making comparisons, it was felt that a collection of broader data would most effectively provide advance insights for shaping policies to address the overall implications of alternative proposals.

3.2 The survey sample

With the above-mentioned aims and limits, a questionnaire was prepared and a survey was conducted at the Smartcard2000 Exhibition and Conference. The exhibition was defined as[5] "the catalyst of high level debate where bold ideas will be both discussed and unveiled". The coverage included areas such as information technology, telecommunications, payments, identification and security, transport and access control, health, e-commerce, loyalty, gaming, multimedia and personalisation card management. As in the previous year, almost all international e-money scheme operators representing either account-based or other scheme proposals participated in the exhibition. Operating systems were also represented at the exhibition, although by only one of more than three specialist firms. Innovators from around the world involved in e-money technology, including smart card producers, semiconductor providers, security and payment system experts and card system designers, participated in the exhibition, many of whom had participated in the first survey. The total number of exhibitors was just over 90, which meant that the coverage of the second survey was not as wide as that of the first survey.

Because the survey results from the previous year proved encouraging, it seemed natural to extend the data collection and analysis of e-money into year 2000. The exhibitions again included many products relating to e-money applications, including electronic wallets, personal computers designed to function like point-of-sale terminals and e-money transfer terminals, secure mobile phones that use biometric technology to guarantee the security of potential mobile e-money applications, re-loadable smart cards that can extend the reach of e-money in retail applications and smart card keys that can expand the scope of applications in payments. Innovators and operators exhibited their latest products, which may reshape the future of e-money technologies, and the exhibition was

[5] Smartcard2000 Show Guide.

useful in presenting the current level of technology and suggesting current and future applications that will exploit the vast potential of e-money technology.

3.3 Methodology and data collection

The methodology and data collection for the second survey were quite similar to those for the first survey, which were explained in section 2. The questionnaire was distributed on the first and second day of the exhibition on a stand-by-stand basis, but this time the interviews required more time to discuss particular products and their relevance to e-money. In particular, e-money that is compatible with mobile phones was given extra time and attention because of its vast potential to create an alternative mobile, and hence flexible, distribution channel for e-money schemes. Moreover, almost all the participants were informed of the aims of the data collection, including basic information about the research project. For this survey, 107 questionnaires were distributed, which was slightly more than for the first survey (105), and 70 were returned. The return rate (65 %), was considerably higher[6] than that for the first survey (49%). Lost questionnaires and refusals to respond (mostly due to a lack of available staff and/or expertise, as most of them put it) were not included in the distribution count and the rate of return was calculated so as to avoid double counting. No pressure was put on participants to answer the questionnaire. Exhibitors with products and services not related to e-money were again not given questionnaires.[7] This time, collection of the questionnaires took place during the first, second and third days of the exhibition.

3.4 Survey results

The questionnaire for this survey included thirteen questions compared to eleven in the first survey, most of which included a comments section. *One theme* of the questionnaire was the technical issues concerning e-money technology such as critical access media, the operating system that is most likely to dominate future applications, the most favoured technology for successful e-money

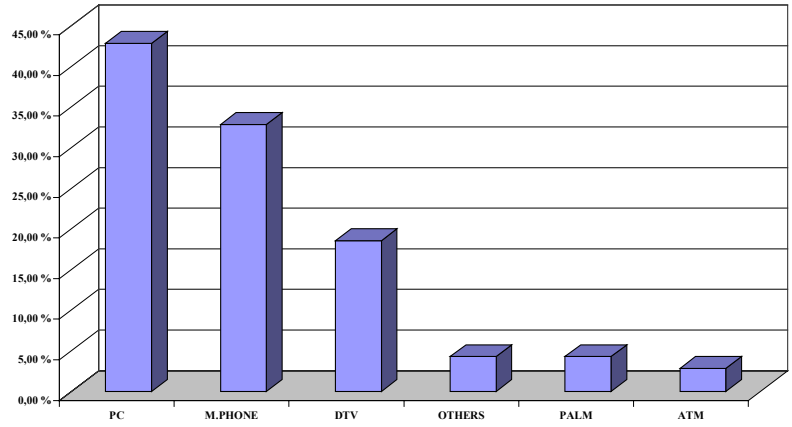
[6] This may be a result of expertise gained a year earlier on the conduct of surveys and measures taken to increase the rate of return.

[7] Extra time was given to some participants in order to help them to understand the questionnaire, especially when they asked questions about the research project in general. Longer interviews were carried out with certain e-money scheme operators and influential innovators in order to gain additional insight into their current applications and future projects. One observation may be worth mentioning: It seems that it is not only the operators that try to manipulate and exploit the potential of e-money and e-money applications. Innovators as well seem to be quite confident to extend their product ranges to enrich e-money applications, both conventional applications, such as transportation applications of card-based e-money schemes, and PC-based solutions for the management of network-based e-money. Innovators seem to work together with different e-money scheme operators in order to provide different application tools required for different applications by different e-money scheme operators. Some of the innovators argued that sometimes it is the innovators that guide operators on the full potential of the technology in order to help operators to extend their coverage on e-money schemes, especially relating to multi-applications. This may help to create a synergy that will speed up of the adjustment of the financial industry to potentials of e-money technology.

implementation, and possible reasons for the failure of some e-money trials. *Another theme* was financial services industry-related problems such as the future medium of exchange for e-commerce, the potential impact of e-money on the industry, non-bank firms that may gain competitive advantage vs banks, potential issuers of e-money, and the banks' position in the industry. The *final theme* was the future of central banks and central bank money in light of the potential of e-money technology and the implications for central banking and national currencies.

The first question on the questionnaire was "Which medium of access technology is most likely to dominate the future e-money developments?". The aim of the question was to find leading indicators for future trends in technology, especially those supportive of e-money with the most potential to dominate the future. The result of the responses is illustrated in chart 3.1.

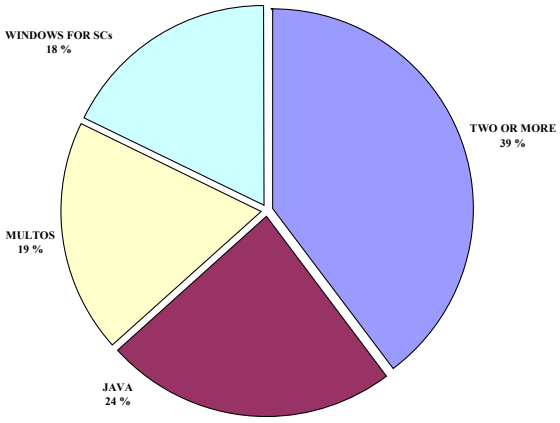
Chart 3.1 **Which medium of access technology is most likely to dominate the future e-money developments?**



It seems clear that the majority of the respondents believe personal computers will be the dominant access medium for e-money, as almost half of the respondents chose it as the potential dominant technology. This result accords with the results from the first survey, as shown in chart 2.9. The mobile phone maintained its place as second choice. It may thus be argued that the PC is expected to play a dominant role in the future of e-money. Digital TV and hand-held devices followed the PC and mobile phone on the list. Alternative proposals from respondents included "any tool that guarantees security", "mobile phone combined with palm" and "point-of-sale terminals". The picture that emerges is that the PC and the mobile phone are well positioned to dominate the future, whereas digital TV, palm and ATMs are likely to play a supportive role.

The second question addressed a technical issue relating to operating systems for network-based e-money solutions: "Which operating system may dominate the future of e-money technologies?" The aim of the question was to investigate whether a particular operating system will play the critical role in shaping the future of e-money or there will be more than one operating system. In this case interoperability will be a primary concern of end-users and hence is critical to the immediate acceptance of e-money for final settlement of transactions.

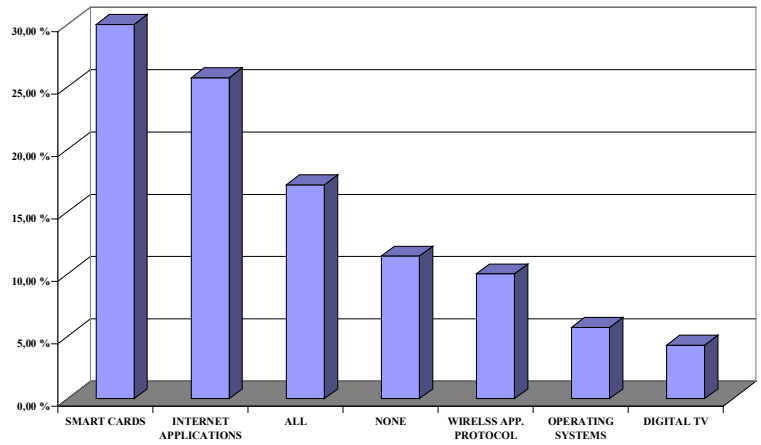
Chart 3.2 **Which operating system may dominate the future of e-money technologies?**



From chart 3.2 we see that more than a third of the respondents (39 %) felt that there will be more than one operating system in the future. This result underlines the importance of interoperability among different e-money schemes for the acceptability of e-money, whenever it becomes available. It may be useful to note that, once there is more than one operating system, all potential e-money access media – such as PCs, digital TVs, palms, ATMs etc - will need to be adaptable to different operating systems, which will require open and pre-agreed distribution for adjustment requirements. Otherwise, it would be difficult to maintain the reliability of circulation of e-money schemes, as households, firms and other economic entities will have to be induced to change their habits of using notes and coins.

The next question relating to technical issues surrounding e-money was about the most critical technology for the future success of e-money applications. The aim was to get innovators' and operators' views on the technology that will play the critical role in shaping a successful e-money rollout. This was expected to enable decision-makers and other e-money discussants to focus on the proper technology in order to judge alternative proposals in terms of impacts and potential for the future. Chart 3.3 illustrates the results.

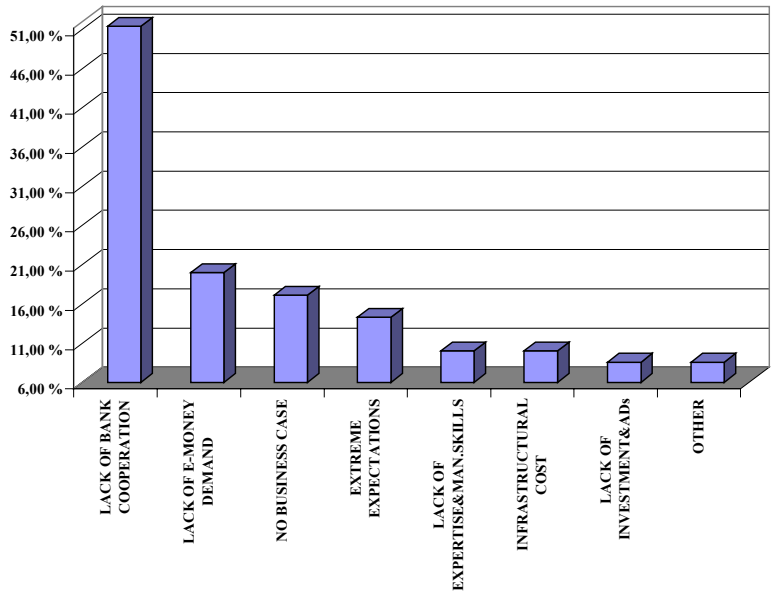
Chart 3.3 **What is the most critical technology for the future (success) of money?**



One sees that smart card technology was chosen as the most critical technology for the future success of e-money proposals. Internet applications ranked second and some 16 % of respondents did not rank the technologies, arguing that all the listed technologies are equally important. “Security”, “service” “user acceptance”, “speed of the applications”, “consumer take-up” and “standardisation” were other important matters listed separately by respondents. Overall, innovators and operators confirmed the latest idea, which is to threat smart cards as the connector between virtual and conventional lives that will open the gate to common solutions to similar problems in two different dimensions of modern life.

The last question on technical issues concerning e-money schemes was “What may be the reasons for the failure of alternative e-money proposals like Digicash?”. The intent was to collect empirical evidence on the reasons that some e-money schemes (at least their first versions) failed and thus aid financial authorities in evaluating the chances of success of future trials. Digicash, which was a very popular concept earlier in the history of Internet, played a critical role in spreading the understanding of e-money and related technologies. The company recently sold all its intellectual property to another firm, including the “blind signature”, which is a critical technology for creating anonymous network-based e-cash. The results for this question are shown in chart 3.4.

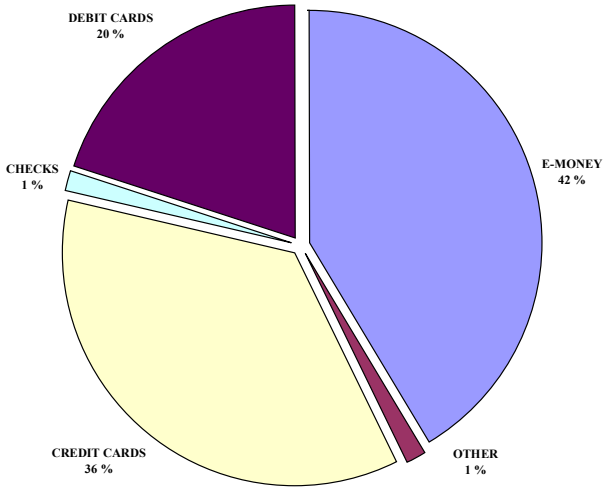
Chart 3.4 **What may be the reasons for the failure of alternative e-money proposals like digicash?**



Note that nearly half of the respondents blamed the lack of cooperation between banks and e-money innovators. This result may reflect the current influence of banks in payment systems and the belief that banks still have a sustainable comparative advantage in payment solutions, at least in the near future. The second-ranked reason for failure was lack of demand for e-money, at least during the trials of first versions. This may reflect the immature stage of the Internet and e-commerce in previous years. Internet penetration was relatively low and the volume of e-commerce was insignificant compared to conventional commerce. The third-ranked reason was lack of a business case for e-money. Again, this result underlines the importance of carefully designed e-money proposals and good timing. The next reason given was exaggerated expectations, which may suggest that future proposals should not create unsustainable and unrealisable expectations for e-money schemes. Other reasons given were "lack of time to market", "lack of government regulation", and "unfriendly consumer interface" combined with "not the right acceptance" and "poor marketing of the product".

After the four questions related to technical issues, the second part of the questionnaire examined the future of the financial industry and the impact and implications of e-money technology on the industry in general and on banks in particular. The first question in this part, "Which payment instrument is best suited for "retail" e-commerce transactions?", was aimed at determining whether current payment alternatives can eliminate the demand for e-money arising from e-commerce, especially retail e-commerce as opposed to business-to-business e-commerce. The results are shown in chart 3.5.

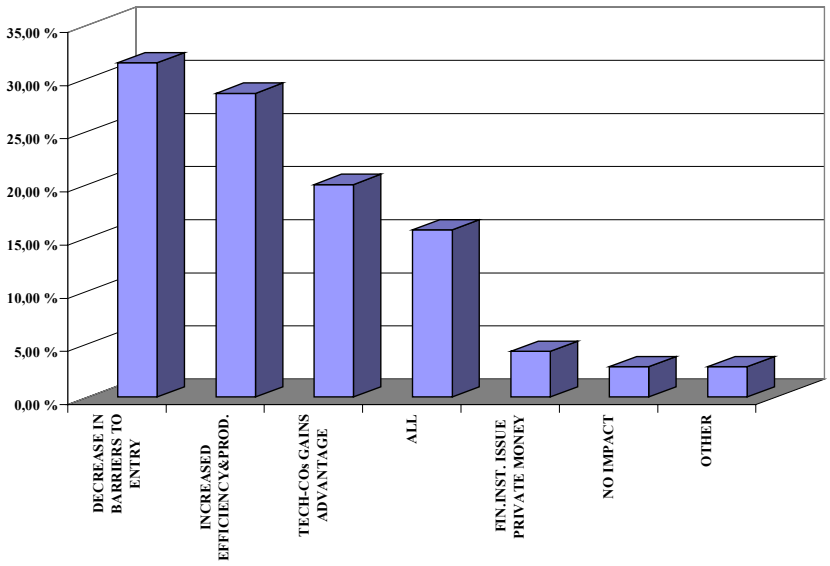
Chart 3.5 **Which payment instrument is best suited for "retail" e-commerce transactions?**



According to the results, e-money will be a "demanded or required" medium of exchange in one way or another and expectations regarding the demand for e-money resulting from e-commerce transactions are characterised as non-illusionary but real. More than 40 % of the respondents believed that e-money is the best instrument for retail e-commerce. Even credit and debit cards, with their historical advantage in consumer awareness and understanding, were outranked by e-money. They ranked second and third as payment instruments for retail e-commerce. This result may indicate a potential pickup in the maturation of e-money schemes in the near future due to rapid growth in value and volume of e-commerce. It may also reduce the reliance on credit and debit cards as e-commerce payment instruments, since even operators and innovators seem not to be relying on them. It may be worth emphasising that e-money products can support credit and debit payments whereas the opposite does not hold. For example, with multi-application smart cards, it is possible to integrate purse, debit and credit functions.

For the next question, "What may be the impact of e-money on the future of financial services industry?", the aim was to clarify the impact of e-money on financial institutions. There are opposing expectations regarding this issue, ranging from no serious impact at all (ie just another innovation related to payment media) to a serious development similar to the initial use of money in primitive societies. The aim of the question was to obtain the views of innovators and operators. The results are shown in chart 3.6.

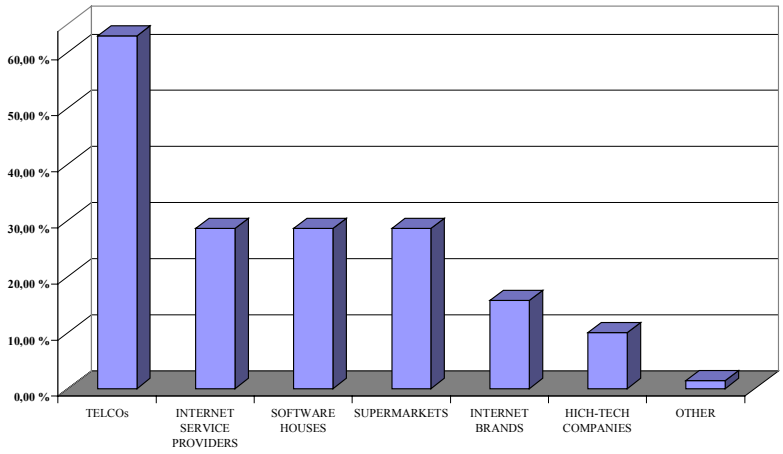
Chart 3.6 **What may be the impact of e-money on the future of financial services industry?**



As the chart shows, more than 30 % of the respondents felt that e-money will reduce barriers to entry to the financial service industry by reducing operating and managerial costs and increasing competition. This result was consistent with the first survey, as seen in chart 2.10. Respondents also believed that e-money will increase the efficiency and productivity of financial service providers. About 20 % believed that telecommunication companies would gain comparative advantage in financial service provision. On the other hand, some 15 % of respondents were neutral as to the impacts, reporting them as equally possible. Almost 5 % also believed that e-money will allow financial institutions to issue their own private money. Other views expressed included "reduction of freight and operating cost", "decline in user loyalty", and "increased income with .com companies".

The next question, "Which institutions are best placed to compete with banks in providing e-money schemes?", was aimed at discovering which institutions are expected to compete best with banks for e-money. The importance of this issue is that traditionally central banks have relied mainly on banks to both collect data and provide liquidity to the financial system. If e-money can change the structure of financial sector, then central banks may need to include non-bank institutions in their price stability operations. The monetary transmission mechanism may be influenced or even changed because of non-bank involvement in financial services. The results follow in the next chart.

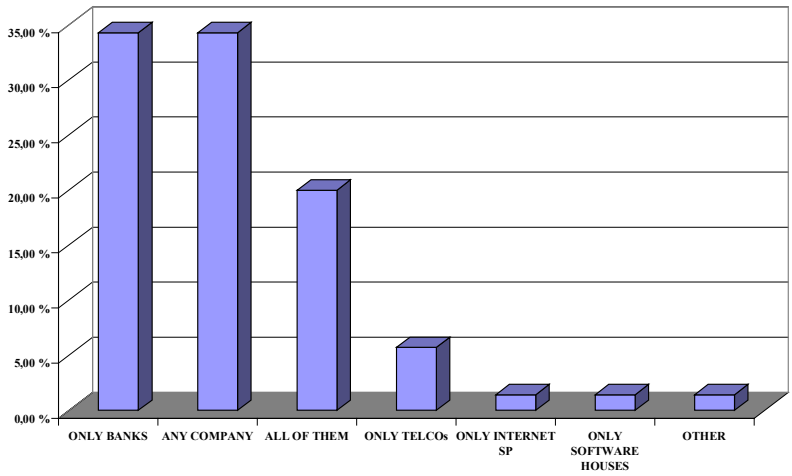
Chart 3.7 **Which institutions are best placed to compete with banks in providing e-money schemes?**



The results from the survey, shown in chart 3.7, point to telecommunication companies, as the majority of respondents cited them as the banks' main competitors. This result may lead to future mergers and acquisitions between banks and telecom companies or banks may try to take over telecom companies or vice versa. The result also underlines the expertise of telecom companies in communication channels, which is expected to dominate retail payment systems in the future, both with wires and recently wireless. Internet service providers, software houses, supermarkets and retail chains followed telecom companies with almost equal percentages. Interestingly, most of these companies have already started to co-operate with banks in one way or another. Internet brands that have gained a certain amount of consumer awareness and confidence and high-tech companies that also support financial service providers with solutions to financial applications were also preferred by some of the respondents. One respondent mentioned "insurance companies and pension funds" while another argued that "banks will not promote e-money".

Another question related to the future impact of e-money on the financial service industry concerned potential issuers of e-money: "Who should be allowed to issue e-money?" The aim was to determine whether banks are still favoured as payment system experts or whether other institutions are also becoming acceptable as e-money issuers. This may have implications for the integrity of financial systems and for monetary stability, which is generally viewed to have primacy in modern financial systems. The results are shown chart 3.8.

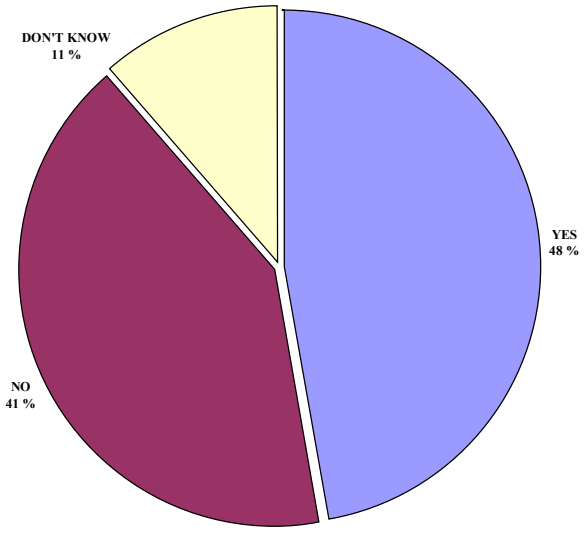
Chart 3.8 **Who should be allowed to issue e-money?**



The respondents seemed neutral as to issuers of e-money, as they equally favoured the options "only banks" and "any firms capable of handling e-money technology". Who is issuer does not seem to be a major concern to innovators and operators, as banks are not clear favourites over other companies. Moreover, the third choice clearly indicated that respondents want all types of firms, including banks, telecom companies, Internet service providers and software houses, to be able to issue e-money.

The last direct question concerning financial service-related issues was on whether banks will remain as the main players in the financial services industry. Banks are the main players in almost all well-developed and stable financial systems, and they play a key role in the monetary transmission mechanism. As a result, it is important for central bankers and others concerned with financial stability (which is necessary for a well-functioning market economy) to understand all the technologies that may influence banks' prospects. The aim of the question, as a result of this importance was to obtain information that will guide central banks in how they should react to the emergence of e-money technologies in light of their impact on the future of banks within the financial industry. The results are shown in chart 3.9.

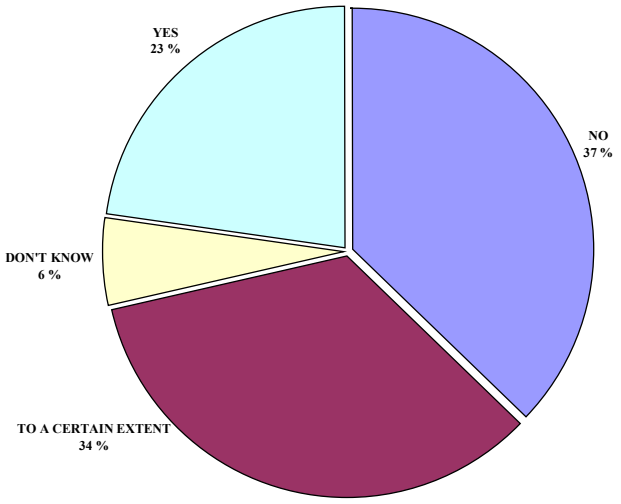
Chart 3.9 **Will banks remain as the main players in the financial services industry?**



Note that less than a majority of respondents believe that banks will be able to sustain their main role in the financial industry whereas more than 40 % believe that banks may not be the main players in the future. The result can be interpreted as being supportive of functional rather than institutional regulation of financial services.

The last group of questions addressed implications of e-money for central banks and conventional money. The first question was on the impact of e-money on the power of central banks as sole providers of monetary base. The results are shown in chart 3.10.

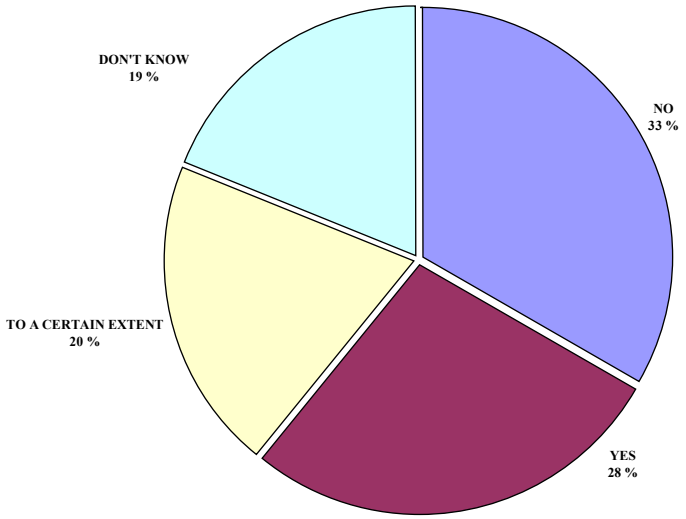
Chart 3.10 **Can e-money technologies eliminate the power of central banks as the sole providers of monetary base in the future (by offering alternative monies issued by other institutions)?**



As the chart shows, the majority of respondents (57 %) believed that e-money technology will eliminate the power of central banks (by offering alternative monies issued by other institutions) as sole providers of monetary base, though 34 % qualified this to a certain extent. If one accepts that operators and innovators will shape the future of e-money technology, then this result could have implications for central banks as sole providers of monetary base. It might raise issues such as that of a monetary policy regime without monetary base or an interest rate transmission mechanism in a competitive currency area.

The next question was on whether e-money will lead to a new free banking era. It also contained the main aspects of free banking, ie the absence of central bank involvement in the financial system and competing currencies issued by different institutions. The aim of the question was to obtain empirical evidence on expectations as to the re-emergence of a free banking era based on the fruits of technological improvements in computation. The results are exhibited in the following chart.

Chart 3.11 **Can e-money technologies lead to a "free banking" era (a system of competing currencies issued by various institutions and without a central bank)?**

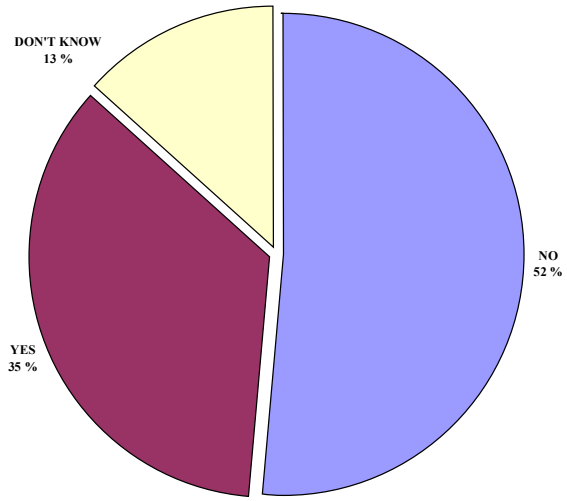


The results, shown in chart 3.12, indicate that almost half of the respondents (46 %) expected that e-money technology would lead to a new free banking era, although 20 % qualified this only to an extent. Those who did not believe that e-money would lead to a new free banking era amounted to about 33 % and those that choose the "don't know" option amounted to some 19 %, which was the highest for any question in the second survey.

The next question was part of the third group of questions, which investigated central banking and money implications of e-money. The question addressed whether there is a potential for a world currency with the advent of the technology. Some academicians and practitioners expect that computer or mobile networks will create a global economy without borders that will require a world

currency or at least a world medium of exchange for this network. The results are shown in chart 3.12.

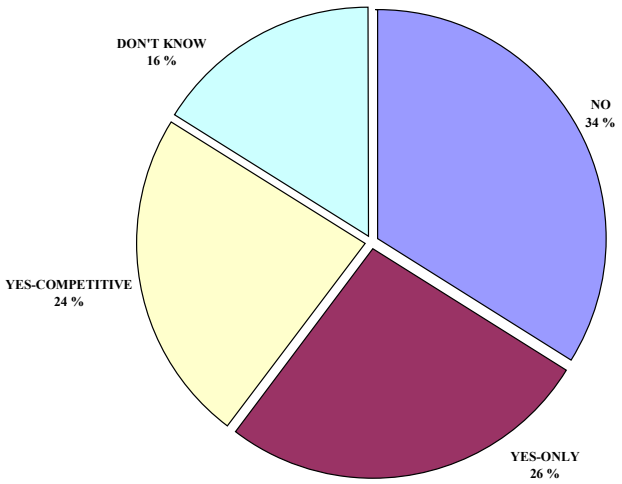
Chart 3.12 **Can e-money create a "world currency" by eliminating most of the currently available national currencies all around the world?**



A slight majority (52 %) rejected the idea of a world currency and about 13 % chose the "don't know" option. One respondent argued that he did not anticipate a world currency because "the world industry is not only around computers". On the other hand, more than a third of the respondents (35 %) accepted the concept of a world currency, a proportion that may have implications for future e-money proposals and regulation. If 35 % of the innovators and operators are convinced of the efficacy of a world currency that could be supported by e-money technology, national currencies, especially those with unstable values, may be under threat. Further, national approaches (including national regulation) of e-money with a global potential may not adequately address all issues concerning e-money.

The last question of the survey investigated the issuance of e-money by asking respondents whether central banks should issue e-money for their own account and hence compete with private banks and/or other institutions. The aim here was to gain insight into expectations regarding the best way to issue e-money in the future and to help central banks prepare for e-money-based monetary and financial systems. The results are shown in chart 3.13.

Chart 3.13 **Should central banks issue e-money for their own account, thus competing with private banks and/or other institutions?**



As the chart shows, only 26 % believed that money should be issued exclusively by central banks. On the other hand, more than a third of the respondents (34 %) clearly expressed their concerns about central bank involvement in the issuance of e-money, as they believed that "central banks should not compete with financial services providers". Moreover, almost a quarter of the respondents favoured competitive issuance of e-money, ie that central banks should compete with private issuers in e-money schemes. As a general conclusion, it seems that innovators and operators do not favour direct involvement of central banks in e-money issuance.

3.5 Conclusions and recommendations

The second survey shed some light on current problems with e-money technology. It is evident that e-money innovators and operators feel that future access products for e-money applications will be dominated by PCs, followed by mobile telephones and digital television (chart 3.1). Regarding the choice of operating system, the respondents believed that, rather than a single operating system, the e-money environment will be shaped by two or even more operating systems (most likely interoperable, as common sense would dictate; (chart 3.2)). Smart cards will be the most critical technology for the future success of proposed e-money schemes, which is not at odds with current trends, as smart cards seem to serve as a bridge between the virtual and conventional life styles, including financial applications. Internet applications followed smart cards as the second most important technology, ahead of wireless application protocols, operating systems and digital television (chart 3.3). The final conclusion regarding technical issues concerns the general reasons for failure of some of the current e-money trials. It was confirmed that lack of co-operation with banks might be the main reason for failure, probably because of banks' comparative advantage, especially in payment

systems. Lack of demand for e-money and lack of a business case, at least during trial periods were given as secondary reasons for failure (chart 3.4).

Second group of findings relates to potential impacts and implications of e-money for the financial industry. It was confirmed that despite a strong position, historically proven success and adaptation to Internet payments, credit and debit cards could be driven out by e-money. Respondents chose e-money as the future payment instrument for retail e-commerce transactions (chart 3.5). The potential impact of e-money on the financial services industry was expected to be a reduction in barriers to entry to the financial service industry, which may already be confirmed, as eg an insurance company's Internet bank proved to be a potential success within less than two years in the UK. Increased efficiency and productivity for financial services and a weakening of bank's comparative advantage, especially vs telecommunication companies, were underlined as secondary impacts of e-money on the financial services industry (chart 3.6). Telecommunication companies were rated as the most competitive vs banks, but Internet service providers, software houses and supermarkets were also mentioned as potential competitors of banks in providing e-money schemes (chart 3.7). Regarding the issuance of e-money, banks and other companies were almost equally favoured, ie banks were not ascribed top-favourite status. It seems that banks have begun to loose their favoured status among innovators and operators as regards the provision of financial services, at least for the issuance of e-money in the future (chart 3.8). Moreover, less than a majority (48 %) saw banks as the main players in the financial service industry. Of the respondents, 41 % clearly stated that banks would not be the main players in the future (chart 3.9).

The final set of conclusions is based on responses to questions on the impact and implications of e-money on conventional money and the current position of central banks. The first result confirmed that central banks might lose their power, at least to an extent, as sole providers of monetary base (chart 3.10). The re-emergence of a free banking era triggered by e-money was expected by 48 % of the respondents, although 20 % qualified this somewhat (chart 3.11). Regarding the creation of a world currency, 35 % of respondents felt this was likely, which can be regarded as a strongly supportive result. A total of 52 % clearly rejected the idea (chart 3.12). The final finding from the survey was that respondents expressed opposition to central banks' monopoly of e-money issuance, as only 26 % supported the idea while 34 % rejected it. Some 24 % of respondents supported competitive (incl. central banks) issuance of e-money (chart 3.13).

There are some general observations regarding the survey results that might be worth mentioning: Innovators and operators argued that the technology and expertise for the launch of a successful e-money scheme could already be considered to be in place. However, they also mentioned the importance of perceptions of the general public concerning technology, which they cited as one of the main causes of delays in full implementation of e-money technology. The innovators in particular expressed a real concern about unsuccessful launches. They argued that each unsuccessful trial postpones a full-scale launch of national roll-outs by many years, even an international roll-out, especially in Europe that is enjoying the benefits of the euro.

4 Comparative analysis of the surveys

We now turn to some comparative remarks on the two surveys. In preparing the second questionnaire, it was not intended to compare the results of the two surveys. However, certain complementary conclusions seemed to flow out of the two surveys, mostly because of overlapping questions. Caution is called for in such a comparison because of the year-long interim period at a time when the e-money phenomenon was changing rapidly. In the course of a year, there may be solid reasons for changes in basic attitudes to e-money. Even a single technological innovation may be capable of changing some of the basic presumptions. But because the questions in the two surveys were closely related, the venue was the same, and the respondents were largely the same, a comparison might be useful, given an appropriate degree of caution. To be sure, many of the questions were not related, as the second survey was designed to be complementary.

The first useful relationship to be cited is between chart 2.1, which indicates that e-money has the potential to replace central bank money (82 %) and chart 3.10, which indicates that e-money technologies eliminate the power of the central bank as sole provider of monetary base (57 %). Both results underline the need for central banks to find and identify new means and instruments, especially so as to minimise their dependence on monetary aggregates in general and on narrow money in particular if they are to preserve their influence on financial markets and their ability to maintain price stability in the event that central bank money is replaced by e-money.

There seems to be a close relationship between charts 2.6 and 3.8. In the former, 50 % indicated that non-banks should be allowed to issue e-money and, in the latter, the respondents were about equally divided as between “only banks” vs “any company”. Both of these results suggest that if non-banks gain the right to issue e-money, central banks – which have traditionally relied on banks to maintain a stable relationship between the monetary policy transmission mechanism and the price level – may be forced to pay more attention to non-bank firms or to focus on monetary functions instead of monetary institutions in their efforts to maintain price stability.

Another noteworthy relationship holds between charts 2.9 and 3.1. In both charts, personal computers and mobile phones were given top priority as access media to e-money, followed by digital TV. It can be argued that operators and innovators did not change their minds during the year as to the future of access products and e-money access. This finding is not at odds with the widespread expectation that network-based “virtual life” will be shaped by developments in three different technologies, ie personal computers, mobile phones and digital television. There are alternatives such as refrigerators or electric cable appliances, but PC, DTV and the mobile phone seem to have a clear lead, at least for the time being.

Two different questions provided very similar results, as shown in charts 2.10 and 3.6. Both indicated that e-money will reduce barriers to entry to the financial industry. Even current trends may be seen to confirm these results, as many banks have begun to prefer either a merger with another bank or cooperation with different companies as means of maintaining a competitive edge. A current study on the implications of innovation in financial technology, especially in respect of

money, argued that “it costs USD 1 million to set up a fully functioning Internet bank” (Gosling, 1999). Even though actual set-up costs may not constitute the only barrier to entry, they are clearly important, and they could well generate innovative financial applications that will open the door to the financial services industry.

Finally, charts 2.11, 3.11 and 3.13 seem to tell a story. The first chart indicates that money should not be privatised, albeit 8 % challenged the idea. In the second chart, 48 % of respondents indicated that e-money may lead to a free banking era and, in the third, 24 % defended co-issuance of e-money by central banks and private institutions while 34 % opposed central bank issuance of e-money. One might interpret this as an indication that during the year between surveys there was a trend toward a more liberal approach to currency issuance, including private money. As long as e-money represents conventional money, its impact may be qualitatively the same as that of any advanced payment system application that reduces the transaction demand for currency in circulation. The real challenge arises when e-money represents freely circulating intrinsic monetary value that is not the same as any national unit of account controlled by a known monetary authority with the intent to defend its value. The results of the surveys suggest that this challenge is seen to exist even at this stage of technology.

Appendix 1

Survey questionnaire 1999

A questionnaire on electronic money developments

City University Business School; Department of Banking and Finance
Research Student: Yuksel Gormez (Y.Gormez@city.ac.uk)
Topic: ELECTRONIC MONEY, PAYMENT SYSTEMS AND MONETARY POLICY

QUESTIONS:

1. **Do you think that electronic cash has a potential to replace central bank money?**
   A) Yes
   B) No
   C) To a certain extent
   D) Don't know
   Comment:___ _____

1a. If yes, when?
   A) Before 2005
   B) Before 2010
   C) Before 2015
   D) Before 2020
   E) After 2020

2. **What are the main obstacles for e-cash to replace the central bank's money (or to be widely accepted)? (Tick all relevant answers)**
   A) Costs for the customers
   B) Costs/profitability for the issuers
   C) Security
   D) Privacy
   E) Interoperability
   F) Legal framework
   G) Technical infrastructure
   H) Cross-border issues
   I) Critical mass of customers
   J) Others_____
   Comment:_____

3. **What should be the reaction of central banks to e-cash?**
   A) In advance regulation for guidance
   B) Wait and See
   C) Leave it to the Market
   D) Other: _____

4. **What do you think about the European Central Bank proposals on the regulation of e-money?**
   A) Encourage Innovations
   B) Discourage Innovations
   C) Neutral effect on Innovations
   D) Other_____
   Comment:_____

5. **What do you think about the European Central Bank proposals on the regulation of e-money?**
   A) Encourage Competition
   B) Discourage Competition
   C) Neutral effect on competition
   D) Other_____
   Comment:_____

6. **What is the base for e-money schemes of the future?**
   A) Card based
   B) Software based
   C) Combined card and software based
   D) All of the Above
   E) Other_____
   Comment:_____

7. **What "access" medium for e-money will be used the most in the future by the customers? (Tick all relevant answers)**
   A) Public telephone
   B) Home telephone
   C) Mobile telephone
   D) Television
   E) PC
   F) Public "ATM"
   G) Other
   Comment:_____

8. **Should institutions other than banks be allowed to issue e-money?**
   A) Yes
   B) No
   C) Don't Know
   D) Other
   Comment:_____

9. **Do you think e-money schemes can decrease barriers to entry to the banking industry?**
   A) Yes
   B) No
   C) Neutral
   D) Don't Know
   Comment:_____

10. Should money be privatised?

A) Yes
B) No
C) Don't know
Comment:_____

Appendix 2

Survey questionnaire 2000

A questionnaire on electronic money developments

By: Yuksel Gormez (Y.Gormez@city.ac.uk)
City University Business School; Department of Banking and Finance
Topic: ELECTRONIC MONEY, FINANCIAL SERVICES AND MONETARY POLICY

SURVEY QUESTIONS:

1. **Which medium of access technology is most likely to dominate the future e-money developments?**
   A. Personal computer (PC)
   B. Mobile telephone
   C. Palm
   D. Digital TV
   E. Automated Teller Machine (ATM)
   F. Other:_____

2. **Which operating system may dominate the future of e-money technologies?**
   A. Multos.
   B. Java.
   C. Windows for Smartcards.
   D. None of the above but_____
   E. There will be two or more operating systems.

3. **What is the most critical technology for the future (success) of e-money?**
   A. Smart Cards.
   B. Internet Applications.
   C. Wireless Application Protocols for mobile phones.
   D. Digital TV.
   E. Palm.
   F. Operating Systems like Java, Multos, Windows for Smartcards
   G. All of the above.
   H. None of the above but_____

4. **What may be the reasons for the <u>failure</u> of alternative e-money proposals like Digicash? (Please tick all the relevant answers)**
   A. Lack of demand for e-money.
   B. Lack of business case for e-money.
   C. Lack of coordination with banks and operators.
   D. Lack of investment and advertisement.
   E. Lack of expertise and management skills.
   F. Exaggerated expectations.
   G. Unsustainable cost of infrastructure to get critical mass.
   H. Other:_____

5. **Which payment instrument is best suited for "retail" <u>e-commerce transactions</u>?**
   A. E-money.
   B. Credit cards.
   C. Debit cards
   D. Checks.
   E. E-gold.
   F. Other:_____
   _____

6. **What may be the impact of e-money on <u>the future of financial services industry</u>?**
   A. E-money will allow financial institutions to issue their own money.
   B. It will only increase the efficiency and productivity of financial service providers.
   C. It will decrease barriers to entry to the financial service industry by reducing operating and managerial cost and increase competition.
   D. Technology companies will gain comparative advantage for financial services.
   E. All of the above
   F. It will have no impact
   G. None of the above but other:_____

7. **Which institutions are best placed to <u>compete</u> with banks in providing e-money schemes? (Please tick all the relevant answers)**
   A. Telecommunication companies like BT and Vodafone
   B. High-tech companies like IBM.
   C. Internet service providers like AOL.
   D. E-commerce brand names like Amazon.com.
   E. Software companies like Microsoft.
   F. Supermarkets and retailer chains like Wal-Mart and M&S.
   G. Other:_____
   _____

8. Who should be allowed to issue e-money?

A. Only Banks.
B. Only Telecommunication companies
C. Only Internet Service Providers
D. Only Software companies.
E. All of the above.
F. Any firms capable of handling e-money technologies.
G. Other_____
_____
_____

9. Will banks remain as the main players in the financial services industry?

A. Yes, they can supply financial services more efficiently than other firms.
B. No, other firms have been gaining comparative advantages especially in digital economy.
C. Don't know.
D. Comments_____

10. Can e-money technologies eliminate the power of central banks as the sole providers of monetary base in the future (by offering alternative monies issued by other institutions)?

A. Yes.
B. No.
C. To a certain extent.
D. Don't know Comment:_____

11. Can e-money technologies lead to a "free banking" era (A system of competing currencies issued by various institutions and without a Central Bank)

A. Yes.
B. No.
C. To a certain extent.
D. Don't know
E. Comment:_____

12. Can e-money create a "world currency" by eliminating most of the currently available national currencies all around the world?

A. Yes
B. No
C. Don't know
D. Comment:_____

13. Should central banks issue <u>e-money for their own account</u>, thus competing with private banks and/or other institutions?

A. Yes, money should <u>only</u> be governed by central banks
B. Yes, <u>all</u> firms including central banks should compete with each other in e-money schemes.
C. No, central banks should not compete with financial services providers
D. Don't know
E. Other_____
_____

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