THE CENTRAL BANK OF THE REPUBLIC OF TURKEY

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Prospects for Electronic Money: A US - European Comparative Survey

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The views expressed here are those of the authors and do not necessarily correspond to the views of the Central Bank of the Republic of Turkey.

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Abstract

This paper extends an investigation of views on electronic money (e-money) operators and innovators on approaches to current issues surrounding e-money. This has been achieved through a survey of major e-money innovators and almost all the international operators, who came together in Miami (US) for an exhibition on e-money and related technologies. The aims of the paper are to update forefront findings from European surveys on e-money related issues and to deepen the understanding of innovators' and operators' views, in order to stimulate further discussion, especially among central bankers, and to eliminate some of the existing ambiguities regarding the possibilities and implications of e-money. Additionally, we have aimed to determine whether differences in perceptions exist among innovators and operators on opposite sides of the Atlantic, as represented by the views of the ECB and the Fed. Our findings do not confirm the existence of such differences, which implies that European and the American innovators and operators did not radically differ in their approaches to the prospects for e-money. It also seems that innovators and operators are still quite confident of the future of e-money, despite the problems and obstacles surrounding current trials, and the central banks' monopoly in the issuance of money as a medium of exchange is no longer an unchallenged truism.

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

JEL Classifications: E58, G28, O29, O31.

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1. INTRODUCTION

This paper extends an investigation of views of electronic money (e-money) operators and innovators on approaches to current issues surrounding e-money. There are two main perceptions (analysed in depth in the following sections), which are essentially those of central banks as represented by the European Central Bank (ECB) and the Federal Reserve (FED). However, two basic motives behind e-money, ie decreasing cost of telecommunications and ever increasing calculation power, are almost irrelevant (or at least not directly relevant) to the main functions of central banking. As a result, it can be argued that the future of e-money is more dependent on the possibilities of innovation and implementation of the new products to real life payment problems as practical solutions through operators. This argument provides an opportunity to compare the e-money perceptions of innovators and operators in Europe (the EU area) and the United States. Two earlier European surveys[1] provided a set of data that reflects e-money perception in the EU, and here the aim is mainly to collect a set of data reflecting the US perception to add to the combination of European questionnaires.

The aims of this survey include all those of the European surveys, including the provision of empirical insights into what innovators and operators driving e-money developments think about the issues of e-money regulation and implications of the advent of e-money for the banking industry and the investigation of the potential of e-money technology as regards the future of central banking and banknote and coin circulation. The overall aim is also and **particularly** to gather data from industry experts and use it to gain helpful insights in order to increase the understanding of differences in perceptions on e-money in Europe and the United States. We *compare* earlier findings from two earlier surveys conducted in London[2]. There were no major changes in the last survey compared to the two earlier ones, other than to combine the questions into a single questionnaire. By keeping the questions almost the same, we aimed at developing a data set that could be compared to the European survey findings. It is expected that this will increase our understanding of the potential and the limitations associated with e-money among decision-makers and discussants, both academics and practitioners, and will help central bankers, regulators and practitioners formulate their approach to e-money and to understand its implications for the financial services industry, including monetary

[1] The European 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 combined surveys analysis was published as Gormez Y.; Capie F.H.; 'Surveys on Electronic Money', Bank of Finland Discussion Papers, 07\2000, Helsinki, June 2000.

policy and financial regulation. It is important to underline that the aim was not to provide detailed information about a given e-money scheme nor the advantages and disadvantages of a particular proposal or the state of current e-money trials around the world[3].

The survey questionnaire comprised 24 questions, most of them with a comments section. The questions entail four basic themes. The first involves questions on the financial regulation of e-money, including the implications of central bank regulatory proposals on innovation and competition. The second theme was the problems and obstacles for e-money arising from technological development, innovation and applications such as a future base for e-money access, as well as future trends influenced by these obstacles. The third theme addressed the direct and indirect influences of e-money on financial market structures like the future medium of exchange for e-commerce, the potential impact of e-money on the industry, non-bank firms that may gain competitive advantages over banks, potential issuers of e-money, and banks' position in the industry. The last theme involved policy issues arising from the development of e-money, especially for the long run, including its implications for central banking and national currencies.

2. BACKGROUND

In the economics literature money is widely agreed to be a generally and immediately acceptable medium of exchange. It allows wealth to be transferred for future consumption (store of value function) and to act as a common denominator for the valuation of goods, services and assets, which enables comparisons of prices (unit of account function). An additional function of money is that it serves as a standard for deferred payments. (Goacher, 1990). Electronic money (e-money) is still in its emerging stage, and it may generally be expected that it first needs to prove itself as a medium of exchange. Without functioning as a medium of exchange, other functions may not follow. In other

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[2] London Olimpia Convention Centre, UK.

[3] Current trials have arguably not been able to provide a business case for e-money. Year 1998 figures for the EU countries were made available for outstanding value in e-money schemes by the ECB (2000): BEF 1.35 billion for Belgium (compared to BEF 438.8 billion in notes and coin in circulation), DKK 18.5 million (DKK 34.5 billion) for Denmark; DEM 0.1 billion (DEM 242.6 billion) for Germany, ESP 1.71 billion (ESP 4.436 billion) for Spain, ITL 1309 billion (ITL 115,200 billion), for Italy, NLG 0.1 billion (NLG 38 billion) for the Netherlands, ATS 0.04 billion (ATS 145.5 billion) for Austria, PTE 04 billion (914.8 billion) for Portugal, and FIM 3 million (FIM 14.8 billion) for Finland. On the other hand, the number of e-money cards increased from 46,077,000 to 77,282,000 between 1997 and 1998 while the number of e-money loading machines increased from 50,347 to 71,080. Hove (2000) looked at the major electronic purse project in Europe and reached the conclusion that 'the initial expectations concerning EP adoption were unrealistic'. The Economist (2000) earlier made a similar argument regarding first versions of e-money trials as 'the reality has proved much less exciting: for electronic cash has flopped badly. Its issuers either went bankrupt, dropped the product or moved into another business' but concluded that the second version or 'new generation of e-cash firms appears to be getting more things right than its predecessor did'. However, interest in e-money does not seem to be diminishing because of failures of first generation e-money trials.

words, the first function that one would expect of e-money is that of a medium of exchange, ie to serve as a medium of payment for transactions. In the final analysis, the expected functions of e-money would be the same as the traditional functions of conventional money. Otherwise, it may not be a serious threat to central bank money but would be treated as an enriched payment alternative to the many instruments already available for states, firms and households.

It may not be incorrect to say that e-money also needs to have all the features of traditional money, ie acceptability, portability, divisibility, durability, homogeneity, recognisability (Goacher, 1990) unforgeablility, atomicity, consistency and isolation (Schoter and Willmer, 1997). As e-money is expected to be made available via a technical device, the following features may promote still wider acceptance:

1. Economy: Transaction costs arising from the usage of e-money should be as low as possible and competitive against other payment instruments because the use of cash is not costly, except for the opportunity cost of lost interest.
2. Interoperability: This refers to the mutual compatibility of different e-money devices, which is widely accepted as one of the most critically required features of e-money because without it the number of potential users may not reach the level of critical mass required to cover the cost of infrastructure investment.
3. Conservation: This feature is required to guarantee that money hold its value over time securely without any technical disturbance. Unless used or destroyed, e-money should be fungible. The store of value provided should be durable and permanent.

The security of e-money can be compared to unforgeability of traditional money, which also needs to be *user friendly*, a function required for ease of use in addition to recognisability. Anonymity of e-money may also be addressed as a privacy concern although even traditional money provides a limited anonymity. Off-line capacity to both transfer and receive e-money would also seem to be a necessary feature.

Current payment instruments provided by central banks and enriched by the financial industry seem to have a problem in meeting the need for a reliable payment medium for so-called micro-payments. Birch (1997) argued that ‘the existing and familiar payment technologies like notes, coins, cheques, debit cards, credit cards, charge cards, wire transfers and so on have not been able to extend their reach from the real to the virtual world’. The author mentioned that the financial industry’s existing payment media loose their utility as the transaction size falls below around £5. Hence one might

argue that there is a clear demand for e-money, at least for micro-transactions, which needs to be addressed not only by the financial industry but also by central banks, since these are the institutions that are responsible for a reliable medium of exchange that enables societies to sustain the division of labour. This may be the reason for why the US Department of the Treasury (1996) included e-money (and electronic payment systems for retail transactions) on the top-ten list of key issues for those with significant interest in financial services. It may also be the reason why central banks have been publishing papers and articles about e-money (BIS, 1996A; BIS, 1996B; BIS, 1998; BIS, 2000; ECB, 1998) and trying to understand its implications.

Although there is still no generally accepted and proven business case for a single e-money scheme, operators and innovators, in trying to create national and international standards for e-money products, have been investing significant amounts of money, time and effort. Their effort ranges from radical proposals like commodity representative circulation of monetary value, which assumes digital and transferable circulation of precious metals like gold, silver, platinum etc[4] as medium of exchange, to 'gift certificates' that can be addressed to a particular mail account only. Failures of different trials around the world did not seem to seriously dampen the interest on e-money proposals.

In this paper, we treat e-money as an entity for which the survey methodology is the best way to gather information in order to gain insight into its prospects, as time series data are almost non-existent because of the newness of the entity. We accept the European Central Bank's (ECB) broad definition of e-money: '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).

3. DIFFERENT E-MONEY PERCEPTIONS

Central banks around the world began to monitor the e-money phenomenon almost as soon as the first applications appeared in the financial industry, without waiting for a proven business case. However, there seems to be a clear distinction between the European (EU) and US financial authority's perception on the proper approach to e-money. The first sign of this difference appeared in EMI (1994), which provided five scenarios for central bank action on e-money and evaluated them as follows:

[4] According to www.e-gold.com; there are 72,720 e-gold accounts world-wide as of September 2000.

1. *No central bank intervention at all*. This scenario was ignored in the light of central banks' responsibility for maintaining the integrity, stability and efficiency of payment systems and for conducting monetary policy.
2. *No restriction on the issuing institution but with central banks exercising oversight*. This scenario is rejected because the funds representing the value of the purchasing power contained in electronic purses needs to be considered as bank deposit money, which can only be held by credit institutions.
3. *Central banks issue electronic purses themselves in competition with similar private sector schemes, using the existing banking infrastructure for the distribution of their electronic purses*. This scenario was found to be inconsistent with the long term trends that led central banks to withdraw from competition with the banking sector and to concentrate on the oversight of payment systems and provision of Interbank services.
4. *Central banks decide that the issue of electronic purses is exclusively a central bank activity and create a distribution infrastructure of their own*. *Under this scenario electronic purses could be given the status of legal tender*. This scenario was not accepted as the best option by the report, which indicates that no EU central banks have a plan to issue purses because of the belief that the consequences of electronic purses may not be different than other cashless instruments. However, it was stated that central banks could at some point be obliged to issue prepaid cards themselves. It was stated that the Finnish central bank had decided to issue prepaid cards itself as a way of preventing the proliferation of non-compatible systems.
4. *The issuance of electronic purses to be limited to credit institutions* and not-fully-fledged credit institutions provided that:

    - They provide only domestic payment systems,
    - They are subject to appropriate regulation, in particular with respect to liquidity requirements, and
    - They are supervised by the institution that supervises credit institutions.

The last scenario was found by EMI (1994) to be the most appropriate one. A wait-and-see approach was heavily criticised due to the heavy investment in electronic purses and to the fact that after heavy investment, it would be very difficult in the future to modify developments later found to be inappropriate. EMI (1994) is a proposal that has had important implications for the regulation of e-money in particular and of innovative financial instruments in general. Because it did not cover software-based e-money, which did not exist when the report was written, indicating that regulation might better be cautious regarding innovative services and that it might be better to wait for at least a partially proven business case before totally shaping the coverage of regulation. Recently, a similar

development seems to be recurring, as wireless application protocols (WAP) for mobile networks have suddenly opened up a new avenue for e-money applications in addition to personal computers and digital TV. The same problem may still exist in a similar way because when the technology behind e-money is not clearly agreed via the market mechanism, imposing regulation may be irrelevant and hence ineffective. For example, perhaps no one will be sure whether tomorrow's payment industry experts will come up with a voice-recognition-based payment solution.

Another expression of the European perception of e-money came three years later with the publication of the Opinion of the EMI Council on the issuance of electronic money in the EMI Annual Report for 1997, but these opinions are mostly covered by the European Central Bank (1998). Clearly, not all the European countries agreed with the report. It was mentioned in ECB (1998) that 'a majority (excluding Denmark, Sweden, the United Kingdom and Luxembourg) adopted the opinions mentioned'. The report on e-money proposed further regulations relating to e-money, including software-based products. It defended a regulatory approach to e-money arising basically from concerns relating first to the need to preserve price stability and also to the need to preserve the unit of account function of currency. Setting out six different and mostly related arguments on the reasons behind the regulation of e-money, ECB regarded it as essential that the following minimum requirements be fulfilled by e-money issuers:

1. *Prudential supervision* of the issuers of e-money.
2. *Solid and transparent legal arrangements* enforceable under all relevant jurisdictions relating to the rights and obligations of customers, merchants, issuers and operators in an e-money scheme.
3. *Technical security* requiring adequate technical, organisational and procedural safeguards to prevent, contain and detect threats of counterfeit in particular.
4. *Protection against criminal abuse* such as money laundering required to be taken into account during the designing and implementing stage.
5. *Monetary Statistics Reporting* for the purposes of monetary policy to be supplied to the relevant central bank.
6. *Redeemability* as issuers proposed to be legally obliged to redeem e-money against central bank money at par at the request of the e-money holder. (Details were said to be specified).
7. *Reserve requirements* as a possibility for central banks to impose on all issuers of e-money.

Finally, the BIS (2000) gave the latest source of European perception on e-money, as the ECB stated that 'it is crucial that the development of the e-money should take place within a regulatory framework which takes into account the public interests pursued by central banks'. The Eurosystem's

view is that ‘a clear and prudent regulatory framework for e-money will actually promote its acceptance by the general public and its development’. (BIS, 2000; pp.22-23).

Another dimension of the European perception for e-money comes from an EC directive, which is about to be published in the Official Gazette. Now almost in finalised form, the directive is expected to allow non-banks to issue e-money under certain conditions. First of all, the total amount of financial liabilities related to outstanding e-money should normally not exceed EUR 5 million and should never exceed EUR 6 million. Additionally, the maximum reloadable amount is specified as EUR 150 per technical device. This normally implies a maximum of 33,333 cards, but it seems that the operator is to be allowed to choose a maximum reload limit of EUR 100, and the card number may be increased to 50,000 (or more by further reducing the reload amount). Secondly, the bearers of e-money are allowed to ask for redemption and that ‘redeemability should always be understood to be at par value’.

Contrary to the above-mentioned European perception, the US perception on e-money seems quite different. US Department of the Treasury (1996) mentioned the European perception and argued that ‘limiting the issuance of electronic cash to banks could stifle competition and innovation’. The paper advised the US government to ‘combine patience with aggressive fact-finding, study and co-ordination among government units both nationally and internationally’ to meet its responsibilities.
Further, Greenspan (1997) clearly came out against early regulation of e-money, stating that ‘if we wish to foster financial innovation, we must be careful not to impose rules that inhibit it. I am especially concerned that we not attempt to impede unduly our newest innovation, electronic money, or more generally, our increasingly broad electronic payments systems’.

Investigating the legal and regulatory framework across the world for e-money, Good (1997) proposed an international body to address the issue of dispute resolution in connection with e-money. The author argued that product standards and regulation are needed for e-money technology to be a serious alternative to central bank currency circulation and suggested that payment systems would be a challenge for policymakers, who must find a fine line between providing safety and stifling innovation. In a later paper, (Good, 1998) she reached six conclusions on e-money issues for the future prospects for e-money systems in the US:

1. E-money systems will slowly be adopted by the US consumers as an additional payment method.
2. Those e-money systems that are most ‘cash-like’ will more likely be accepted for non-Internet purchases.

3. Technology acceptance is accelerating and this will speed the adoption.
4. Stored-value products that offer multiple applications, including incentives, are more likely to be accepted by the consumers.
5. Acceptance by European and Asian countries, as well as the developing countries, will push acceptance in the United States.
6. The market for electronic money systems should be allowed to develop on its own without government intervention.

The last finding underlines the difference in the US approach to e-money issues relative to the European perception, and there are further indications of differences. Gramlich (1999), for example, valued 'obvious efficiency advantages in terms of ease of handling and record keeping for consumers, merchants, the banking system and the Federal Reserve' arising from the advent of e-money. The author named the 'network problem' as the major hurdle for e-money product and concluded that because of the chicken-egg problem faced by innovative proposals like e-money with network problems, the government could possibly intervene to effect a solution but 'alternatives to stored-value products are cheap and safe enough that such intervention is both economically unwise and politically unlikely'.

This year; Greenspan (2000), again came out against a pivotal role for the public sector in setting the shape of payment systems for merchants and households. He advises that these be left to the private sector and would limit the government's regulatory role to a focus on 'risk management systems', arguing that with complex financial systems, 'detailed rules and standards have become both more burdensome and less effective'. Greenspan mentioned one important role for the government in respect of payment system regulation, ie 'to help identify and, where appropriate, help remove barriers to innovation'.

Finally, the Federal Reserve publicly declared recently (BIS, 2000) that, 'the introduction of electronic money is not expected to have any effect on monetary policy implementation – neither reserve demand nor reserve supply is expected to be significantly affected. The situation will need to be monitored if and as electronic money balances expand'.

The above comparison can be summarised as the in-advance regulatory approach to e-money in Europe vs the leave-it-to-the-market or at least wait-and-see approach advocated in the US.

4. THE SURVEY SAMPLE, RESEARCH METHODOLOGY AND DATA COLLECTION

The choice of venue for this survey was based on the assumption that the future of electronic money will most likely be shaped by the technology and the applications flowing from related technologies[5]. The exhibition in Miami attracted nearly all known innovators and operators of e-money, and it may be argued that it had nearly the widest coverage of all such commercial exhibitions around the world.

The reasons for combining the two surveys that were conducted earlier were, first, e-money technology (both hardware and software) is changing very fast. Secondly, the particular aim of this survey was to make a comparison of the results, which needed a combination of two European surveys. The first eleven questions in this survey are from the first survey and the rest are from the second. This survey was conducted at the Cardtech\Securtech2000 Conference and Exhibition, 1-4 May 2000 in Miami Beach, Florida, which was announced as 'the World's premier card and security technology conference and exhibition'[6] at its tenth anniversary. The venue described itself as 'sizzling solutions for a digital world'[7] and promised 'everything you need to know about smart cards, biometrics, public key infrastructure, identity, e-commerce, mobile telephony, loyalty, mass transit, health care, banking… and more'. All the named sectors may be accepted as directly or indirectly related to the future of e-money. The reason for this is that every smart card with multi-application potential helps to create critical mass for rollouts with their available memory for electronic purse applications in addition to the original function. During the time of the survey, most of the named sectors exhibited mostly smart card-based solutions in their field of interest. The organisers expected more that 10,000 IT professionals and solution providers, not only from the US but all around the world (65 nations) to join the exhibition.

The exhibition promised opportunities to learn, network and conduct businesses in a total immersion in the latest technologies and real-world demonstrations, and more than 300 'hot' technology companies (card and equipment manufacturers, vendors, developers, integrators and producers of related technologies) were being hosted. They offered their solutions in 'identification and authentication, public key infrastructure, cryptography, anti-counterfeiting technology, electronic payments and more[8]'. As the organisers had 'promoted advanced card, identification and security

[5] This assumption was valid for the European surveys as well and as a result, all survey analysis in this paper reflects only the views of innovators and operators and excludes academicians, central bankers, private bankers, investors etc.
[6] Show Guide
[7] Leaflet: Supplement to IDWorld.
[8] Show Guide and Leaflet: Supplement to IDWorld

technologies through educational and networking programs for professionals at every level of expertise' over the previous nine years, their intention for this year was to 'present a superior line-up of workshops and seminars and a comprehensive array of industry exhibits to further this vision'. The workshop and seminars' coverage highlighted the profile of survey sample, as almost all of them were directly or indirectly related to e-money. Some of the topics were 'Advances in Card Technology', 'Enhanced Private Key Protection', 'Cryptography Technology', 'Smart Cards and the Internet', 'Multi-Application cards: Managing Business Relationships and Security', 'Changing the Face of Money' and 'Financial Applications'. The last two were being followed during the survey in order to shed light on the current stage of discussions and proposals surrounding e-money.

The coverage of the survey was impressive: Compared to surveys conducted before, the number of participants was almost tripled. Operating system developers joined the exhibition without exception, three of them being represented individually. All of the major international scheme operators were there as well. The major smart card innovators seemed to play an active role not only in the marketing of multi-application potential but also in presenting current solutions to problems that could slow the speed at which applications reach their full e-money potentials. At the same time, dynamic small and medium size innovators showed their enthusiasm for providing alternative and practical protocols and made proposals regarding niche problems surrounding the development of advanced payment systems, both for closed circuit trials as on university campuses and open circuits as in Internet environments.

As a result, it may be argued that the survey sample, which included almost all of the relevant international operators, almost all of the main national scheme holders and almost all of the e-money innovators around the world, was representative for the above-mentioned aims. We believe that the event had excellent coverage for collecting data on emerging e-money technologies, as all the main players came together for a sufficient time to provide the necessary accountability for a survey.

The survey venue was visited one day before the exhibition started and, because of the extremely large size of the exhibition venue, it was decided to distribute the questionnaire on a selective basis. It was almost impossible to visit all of the 300-plus stands on the first day and to expect questionnaire responses from all of the participants. The exhibitors are divided into two groups according to business line. Those directly connected with e-money, such as scheme operators, operating system innovators, advanced smart card developers, secure payment solution providers etc, were given top priority for the distribution process. Almost all of these innovators and operators were given a

questionnaire on the first day of the exhibition, and in the afternoon they were visited in order to gather the responses that were already available. The rest of the first day was spent distributing questionnaires to others.

The second day was used for conference attendance, additional distribution of questionnaires and data collection. In addition to the survey, the event provided an opportunity to follow current discussions by attending presentations directly related to e-money. The final day was used mostly for collecting responses and filling replacement requests for lost questionnaires[9].

In all, 250 questionnaires were distributed during the survey, from which 97 responses were collected, giving a return rate of about 39%. This was lower than the rates of return for the European surveys (49% for the first survey and 70% for the second). On the other hand, the number of questionnaires distributed was the higher than for the European surveys (107 and 105). The reason for this difference is the size differences in the survey samples. The difference on the rate of return may be explained by the very busy and hectic environment, as many exhibitors lost the questionnaires and had given their priorities to 'commercial' activities, which should be respected. The rate of return was calculated so as to avoid double counting. Replacements for lost questionnaires given were excluded from the total distribution figure[10].

The reliability of the survey sample finds support from an exhibition practice: The exhibition identity cards for entrance were multi-application smart cards with electronic purse capability. Every card contained the monetary value equivalent of USD 3, which was to be spent on the exhibition premises, ie generally on vending machines located throughout the conference area. The cards owned during the time of the exhibition were being tested as to functionality, and the application proved successful.

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[9] The experience gained from the European surveys and familiarity with the names of major innovators and operators facilitated planning for the circulation of questionnaires. Those exhibitors totally on the manufacturing side with totally irrelevant businesses to e-money like card cleaners, cardholder producers etc, were excluded from the sample and were not given questionnaires. The distribution process included interview sessions with exhibitors, especially those that are not known and about which their products and services were not familiar. The purpose of these interviews was to determine their relevance to the survey sample. Additionally, potential participants were informed of the aims of the data collection process, including basic information about the research project (whenever time constraints allowed). Private interviews were conducted with major institutions that were believed to play critical roles for the development of e-money. They were questioned on their visions for the future and on their current proposals with expected adjustments. Most of these interviews provided useful information to update perceptions on the present level of e-money developments and to increase the understanding of future possibilities.

[10] There were some exhibitors who refused to fill out questionnaires arising from 'legal' concerns that led them to avoid expressing views on anything in order not to be 'judged' by industry regulators later, despite our guarantees on the anonymity of the survey. Some exhibitors declined to take a questionnaire because of the priority given to commercial

The same card was given capabilities like food allowances as well. In addition to this particular experience, the venue was a showcase for the latest hardware and software related to e-money and the latest programs and latest schemes were described to related parties. It can be argued that interest in e-money and related technologies has been growing as an accelerating rate.

There were certain limitations regarding our comparative aims in this survey:

The first limitation is that the surveys were conducted at different times, the time lag between the first and last surveys being 14 months, which may be considered a 'long' time in this rapidly changing phase of innovation relating to e-money. The time-lag between the second and final surveys was three months, which may be assumed to be quite reasonable. Time lags, rather than perceptual differences, may have caused most of the similarities and differences in the findings.

Secondly, the rates of return were different for all the surveys, as sample sizes are different, especially for the last survey, compared to the first two.

Finally, this paper assumes that surveys conducted in Europe reflect the European perception whereas the last survey reflects the American perception, as it was conducted in the US. Because most of the innovators and almost all of the operators are structurally 'international', this assumption requires some caution. As an observation, there were many companies represented in all of the three surveys. On the other hand, we felt that the settings of the surveys would reflect local views, as even international companies adapt to local approaches for their businesses, which is e-money in this case. Moreover, we have found significantly different associations on eight of the 23 questions, which suggested that the samples are not overlapping (appendix 2).

5. SURVEY RESULTS

This paper has focused on differences in survey results, as the earlier analysis provided the innovators and operators perceptions in depth and it seems unnecessary to go through a similar set of opinions here. The survey analysis will include a '**comparison**' between survey findings categorised as a reflection of the American perception and the European surveys, which are categorised as a reflection of the European perception.

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activities. Other non-responses were mostly because of a lack of time, lack of available staff or lack of expertise, as most of them put it. No pressure was put on any participants because of ethical concerns.

The analysis of survey results is divided into different groups. The first section will look at the basic differences in the findings of this survey as compared to the European surveys. The following sections will look at earlier results, also for comparative purposes. This section will comprise four divisions: regulation-related results, technical issues, financial market structure and policy issues. A comparative table is presented in the appendix, which summarises the results. The comparison is based on the table instead of the charts for the data with similar results. The reason for choosing this approach is that the preference has been put on the differences in order not to repeat findings that are similar to those already published in connection with the European surveys[11].

5.1. MAJOR DIFFERENCES

The determination of questions with different opinions among European and American innovators and operators was decided with the aid of a statistical test, ie the Chi-square test[12] with a significance level of 5%. The second appendix gives the overall p-value results. In summary, seven questions out of 23 provided totally different opinions between Europe and the US whereas four questions came out with close opinions and the remaining twelve questions gave similar, if not the same, results. In the following section, those responses to the questions that provided major differences compared to the European surveys will be analysed individually in depth, using both bar and pie charts. Bar charts will include a line giving the findings from the European surveys in order to make the comparison easier.

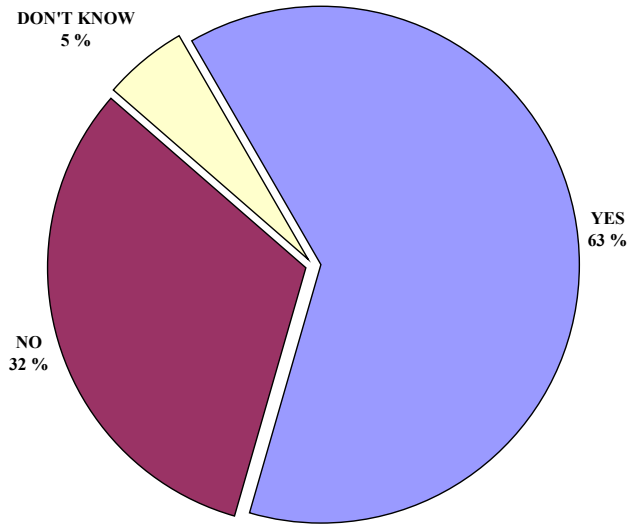
Discussions about e-money can only be justified if the technology has the potential to provide a sustainable replacement for banknotes and coins. Such a potential may have implications for both the privatisation of seigniorage revenues and for the conduct of monetary policy. Otherwise, it may just need to be analysed as another complementary innovation in advanced payment systems, which have been developing fast, especially since 1980, due to advances in credit and debit card applications. That's why, the question "Do you think that electronic cash has a potential to replace central bank money?" aimed to find out whether e-money technology is perceived as mature enough to replace

[11] Gormez, Y.; Capie, F.H.; "Surveys on Electronic Money" Bank of Finland Discussion Papers, 7/2000, June 2000, Helsinki, Finland. (BOF, 2000) (http://www.bof.fi/env/rhinden.htm).

[12] The Chi-square test compares observed frequencies to expected frequencies in the samples. In our case, the EU survey results are compared to the US survey. As 'quantities' were not numerical in our surveys, the Chi-square test was chosen over correlation analysis to measure association between quantities. (Neave and Worthington, 1988)

currency in circulation produced by central banks' and treasuries' banknotes and coins. Due to the importance of the issue, it was reasonable to delete the 'to a certain extent' option from the possible answers. This was done to clarify further whether the presumed potentials of e-money would be confirmed by innovators and operators with a clear choice so that one of the most critical issues connected with the emergence of e-money could be analysed with a clearer result. Consequently, this was the only question that was changed compared to the European surveys. Because of this adjustment, the p-value is not applicable in this question. The result of the responses is shown in the following chart.

CHART 1: CAN E-MONEY REPLACE CENTRAL BANK MONEY?



The innovators and operators confirmed the potential of e-money to displace central bank money in circulation with all its implications for payment system stability, eg the correlation between efficiency of the payment system and efficiency of the monetary transmission mechanism. The majority of respondents believed in that potential without limiting their expectation to any extent, surpassing non-believers (31%), as only 32% did not see a potential for e-money to replace central bank money. In the European survey, even with the exclusion of the 'to a certain extent' option, believers in e-money technology's potential to eliminate banknotes and coins surpassed non-believers by 17%, and 82% agreed on the potential, although 47 % limited it to a certain.

This result may be a confirmation of the maturing stage of e-money technology on both sides of the Atlantic. The increase in the number of believers confirms this result, but as 32% did not agree to this potential ie 15% higher than in the first survey, it appears that there is no full consensus yet on the

elimination of central bank money. The ever-changing pace of e-money related technologies might be a reason for the lack of full consensus.

The complementary question to the first one was “If yes, When?”. This was answered by 63% of those who said ‘Yes’ to the first question. The aim of the question was to find out the expected lead time for e-money technologies to replace banknotes and coins and to quantify whether central banks and regulators would just take their time to analyse e-money products or should immediately develop policies arising from their responsibilities for monetary stability. It was expected that such a finding might give central banks and regulatory bodies an idea of the timeframe for their decision-making.

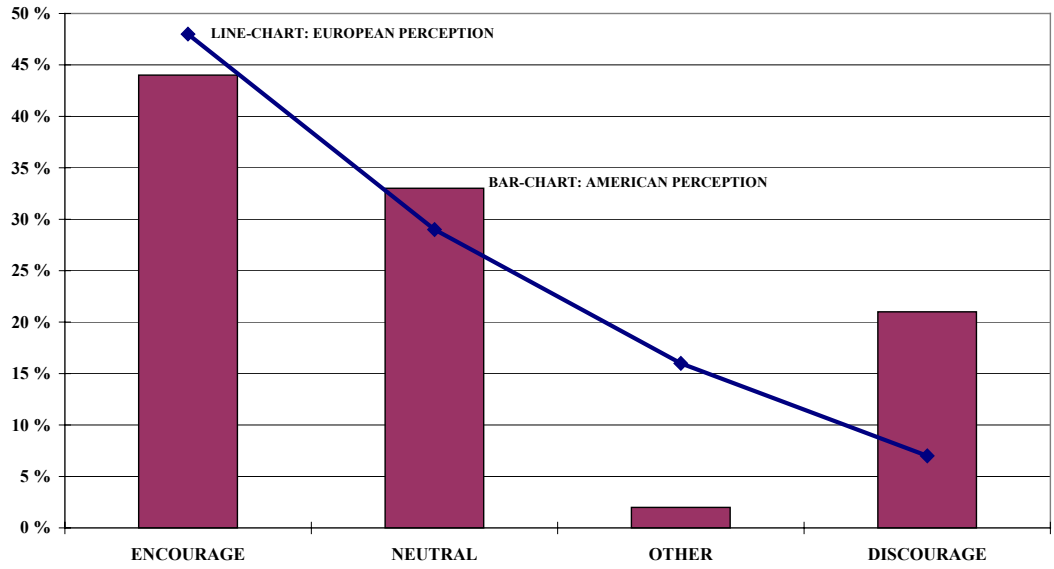
The result indicates that 56% argued that it will take e-money 10 years to replace central bank money, which was slightly more than for the European survey (55%) but the difference may be accepted as minor. This may imply that both European and American innovators and operators almost agree on the speed at which central bank money would disappear from circulation, and all 61 participants who believed in the total replacement of currency in circulation by e-money believe that it will happen sooner rather than later. This agreement was confirmed by the statistical analysis as well, as the p-value for this question was 0.999, ie the highest for the 23 questions. Only 18% indicated that the replacement of CB money would be realised after 2020, compared to 17% for the European survey, again very similar results.

If it is agreed that e-money replacement of central bank money is a ‘once and for all’ phenomenon and if innovators and operators are accepted as the main drivers behind e-money technology, then central banks had better shape a clear policy rule for their policy actions on this emerging payment solution. There seems to be no clear distinction between European and American perceptions on the speed of replacement by e-money, which may lead to a demand for a similar or not totally different policy from both sides. If e-money progress is viewed similarly by innovators and operators on different continents, it may be expected that central banks and regulatory agencies in different countries might intend to form similar policies with respect to e-money.

Two questions addressed regulatory issues with the aim of finding out how innovators and regulators will react to central bank proposals on the regulation of innovation and competition. It was of interest of investigate the general belief that there is a negative correlation between regulation and innovation, especially in the US. The intention was to find out whether innovators and operators regarded regulation as a barrier to further innovation and whether it was regarded as anti-competitive. In the

EU questionnaire participants were asked how they felt about 'ECB regulatory proposals', whereas the US participants were asked about 'potential central bank regulation', as the Fed had not yet made any regulatory proposal.

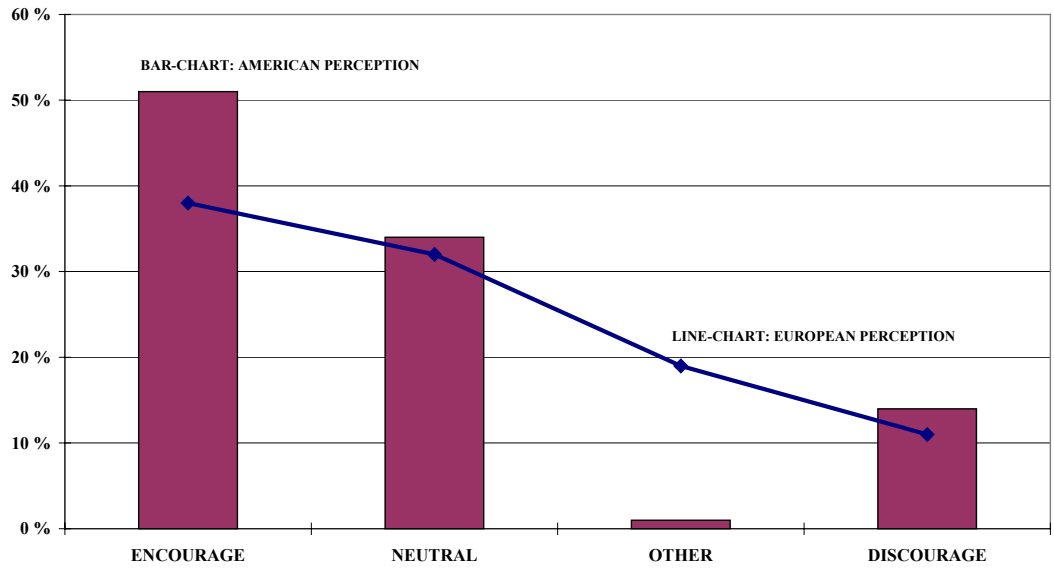
CHART 2: INNOVATION IMPLICATIONS OF CENTRAL BANK REGULATION OF E-MONEY



In the European survey, almost half of the innovators and operators apparently favoured regulation, as they did not regard it as a barrier to innovation incentives and less than a third saw a neutral effect for ECB proposals on innovation. In this survey, support for the encouraging impact of regulation dropped below 50%, but the main difference was the 14% increase for the 'discourage' option. American innovators and operators seem to have a concern for the impact of central bank regulation on e-money innovation, at least to a much greater extent than their European counterparts, but there are no radical differences. The real difference seems to lie in the fact that the typical EU participant preferred to stay out of the discussion if he was not familiar with the ECB proposals and so choose the 'other' option, whereas the typical US participant actively joined in the discussion, so that the preference for 'other' option decreased by 14 % compared to the EU. Consequently, the p-value for this question was 0.005.

As regards the impact of central bank regulatory proposals for competition among different e-money schemes, the chart below shows the results. The question had a p-value of 0.001.

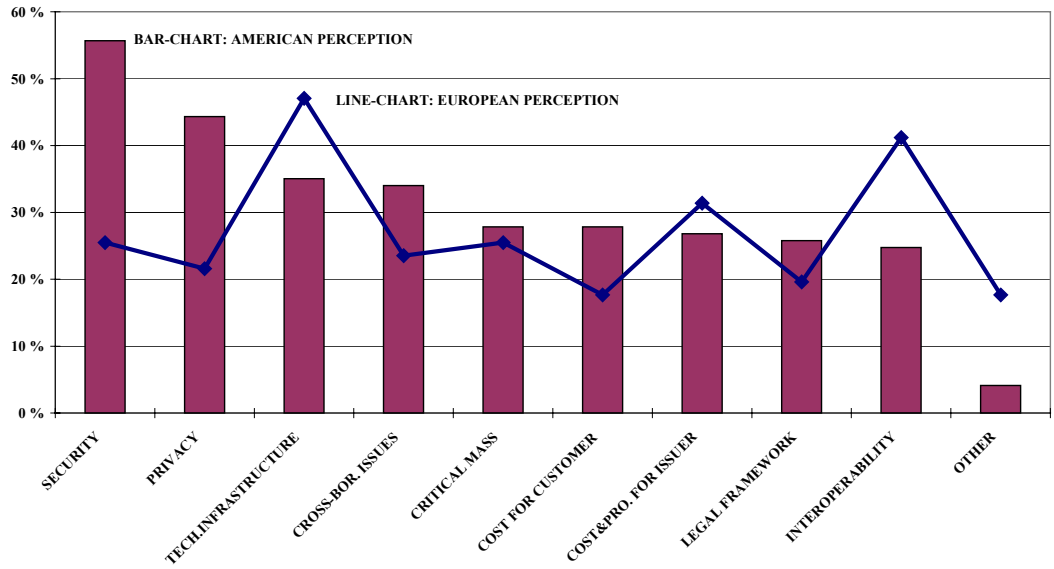
CHART 3: COMPETITION IMPLICATIONS OF CENTRAL BANK REGULATION OF E-MONEY



As the chart shows, support for neutral effects in the American survey was not much different, being just 2% less than in the European survey. The real difference was with respect to the belief that central bank regulation would encourage competition in e-money business, which got 13% more support in the US where it exceeded the 50% level. American innovators and operators in a sense argued that even though regulation may stifle innovation it might support competition among different e-money proposals. There seems to be no clear indication that central banks should be concerned about their regulatory attempts with regard to direct or indirect discouragement of innovation and competition. In either case, supporters of the 'encourage' option outnumbered supporters of the 'discourage' option. Interestingly, European innovators and operators were concerned more with competition whereas Americans seemed to be more concerned with innovation. The strong intervention by American law enforcement agencies in recent days in regard to monopolistic practices could have affected this difference, as innovators and operators on the other side of the Atlantic might rely on regulators for the defence of competition in corporate America.

The question that has provided another very different outcome for this survey with a p-value of 0.002 was about obstacles to wide acceptance of e-cash as a replacement for central bank money. The questionnaire listed some of the problems thought of as the main obstacles to the successful emergence and strong maturation of e-money, and the respondents were asked to give their priorities. The aim of the question was to find out what kinds of barriers now and in the future would limit the practical realisation of the technical potential of e-money. The chart below shows the results.

CHART 4: MAIN OBSTACLES FOR E-CASH TO REPLACE CENTRAL BANK MONEY

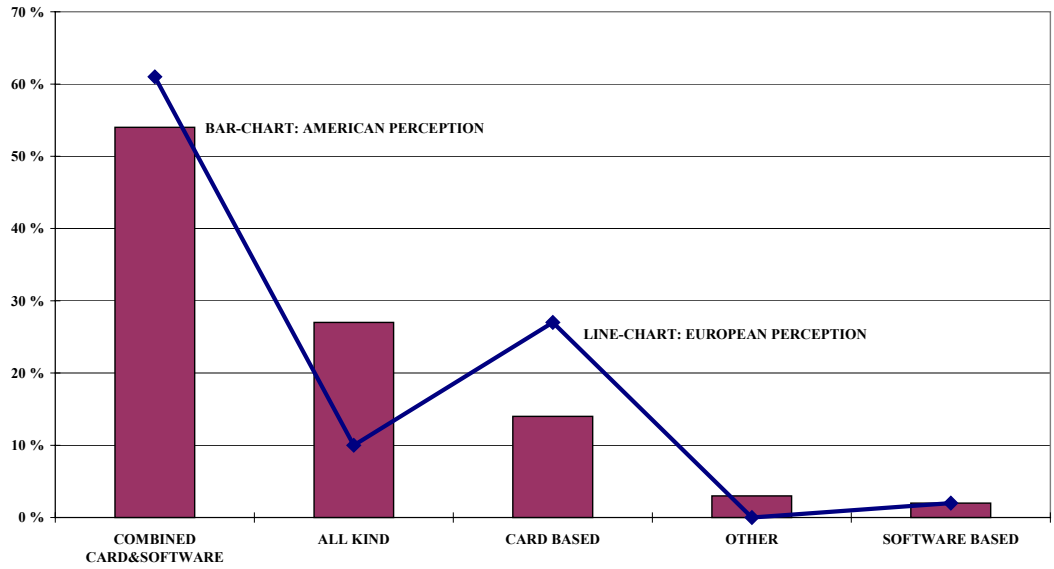


Participants in the European survey, felt that the required technical infrastructure, including retailer readers, customer cards and software, was the leading obstacle for e-money to replace CB money, as almost half of the participants indicated this. Interoperability of different e-money schemes ranked second, and cost and profitability for issuers ranked third. Few of the participants mentioned security and privacy as main obstacles. The picture in the US is *totally* different. As the above chart shows, US innovators and operators gave top priority to the security level of e-money schemes and privacy of e-money holders was ranked second. The differences were not limited to this at all: Interoperability, which was the second biggest issue for Europeans, came out almost last for the US.

The agendas of innovators and operators on opposite sides of the Atlantic seem to be quite different in terms of presumed obstacles. They seem to put quite different weights on quite different issues. One explanation for the difference as regards the *security* issue may be that Europeans had already experienced the convenience of smart cards, especially in France, whereas America seems only now to be catching up, but differences still remain unresolved for *privacy* perception.

In another question, three different proposals on the future base for e-money, namely card-based, software-based or a combination of the two technologies, that could be supported by an operating system were analysed to determine which one seems to be most favoured by innovators and operators. It still seems unclear whether there will be a demand for both card-based and software-based e-money or for some other combination. The p-value for the question was 0.039.

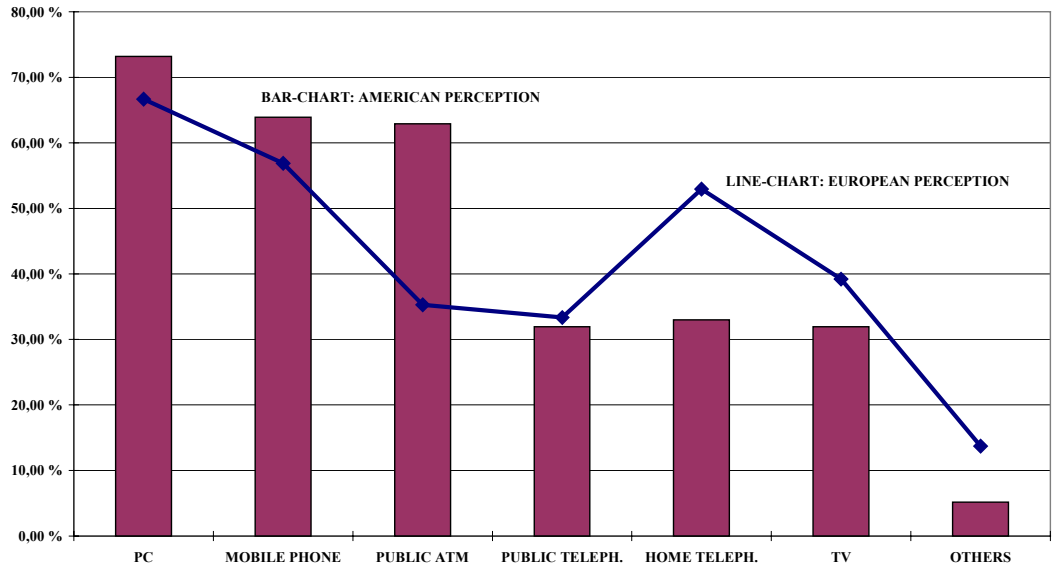
CHART 5: FUTURE BASE FOR E-MONEY SCHEMES



According to the results, the future base for e-money schemes would be a combination of card and software-based products. In this survey, the preference given to the combined version again seems clear even though it was 7% less than in the European survey. The real difference was the decline of 13% for card-based solutions. This result may be related to the relatively mature smart card penetration, especially in France, whereas the US could be considered more advanced in Internet-based services. The biggest jump was at the 'all kind' option, a reflection of Americans attaching more importance to the coexistence of different types of e-money bases, compared to Europeans. The result still points to smart cards, as they seem to be the only technical product that can support a card and software based solution with their individual capabilities and network adaptability. Central banks and other policy-makers may be influenced in their views on e-money by the need for a common solution for payment media, both for conventional and virtual transactions. The convenience of such a choice seems to be confirmed by innovators and operators on both sides of the Atlantic. Other options here included 'ID card based solutions'; 'authentication based biometrics' and 'biometrics', which are the original responses given by the participants.

One question intended to find a leading indicator for decision-makers as to what technology that should concentrate on in their policy reactions addressed another critical problem surrounding e-money schemes, namely the potential access medium for e-money in the future. The aim of the question was to find out potential distribution channels of e-money for future financial transactions, including activities such as downloading purchasing power from a financial service provider's account into a chip card, sending money via digital TV networks, etc. The result, which got a p-value of 0.058, is displayed in the following chart.

CHART 4: ACCESS MEDIUM FOR E-MONEY FOR THE FUTURE

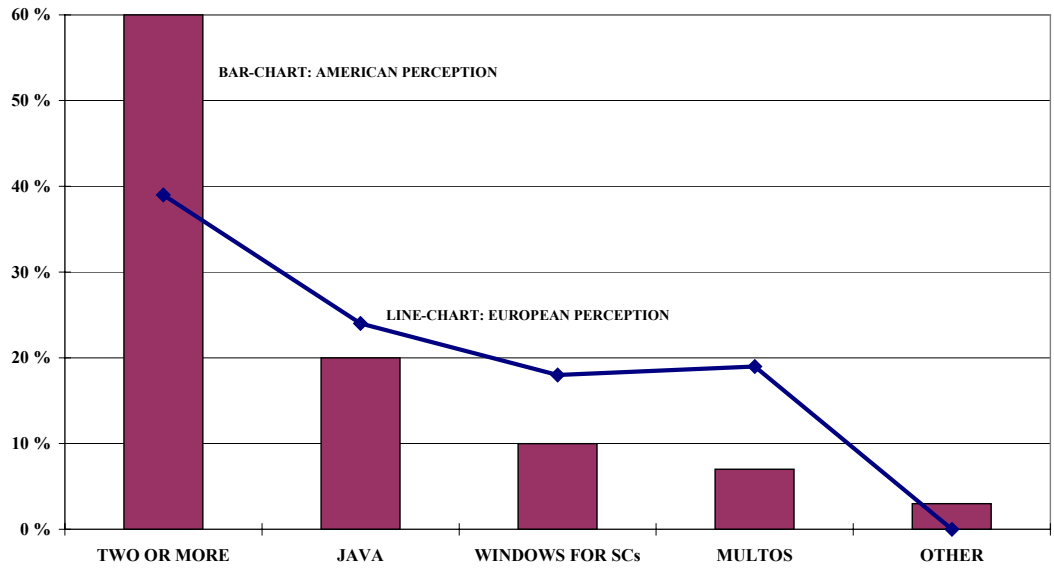


In the European survey; the majority named personal computers as the best access medium for the future and mobile phones came in second. The third best medium was the home phone. TV, Public ATM and the public phone followed the first three options. As the above chart shows, the preferences among American innovators and operators did not indicate a major difference, as the PC and mobile phone took the first two places. However, the major difference as compared to the European perception was ATMs, which ranked as the third most favoured future access medium for e-money, compared to fifth in the European survey, with the difference being 28%. Digital TV, on the other hand, seems less favoured by American innovators and operators. Some participants named alternative devices like 'parking meters, wireless devices, medical cards and transportation tickets, smart cards and readers, and special readers'.

These results may underline the importance of ATM networks in the US compared to digital TV technology in Europe, which is reflected in new terms like 't-commerce' to represent digital TV commerce. The overall result from the two surveys seems to present a three-fold future: First, e-commerce, as represented by the PC, seems to be relatively well-developed already. Second, m-commerce (mobile phones) seems to be very popular in current discussions. Lastly t-commerce is growing rapidly in some European countries like the UK, as digital TV penetration increases fast on the heels of the first two. The operators and innovators seem to imply that e-money will be circulating with all these network-based business solutions in digital form and will provide payment solutions for financial transaction settlements in e-commerce, m-commerce and t-commerce.

The question 'Which operating system may dominate the future of e-money technologies?' was designed to investigate whether a particular operating system will play the critical role in shaping the future of e-money. There may also be more than one operating system, which would require interoperability for end-users for acceptance of e-money as final settlement at transactions. The p-value for this question turned out to be 0.015.

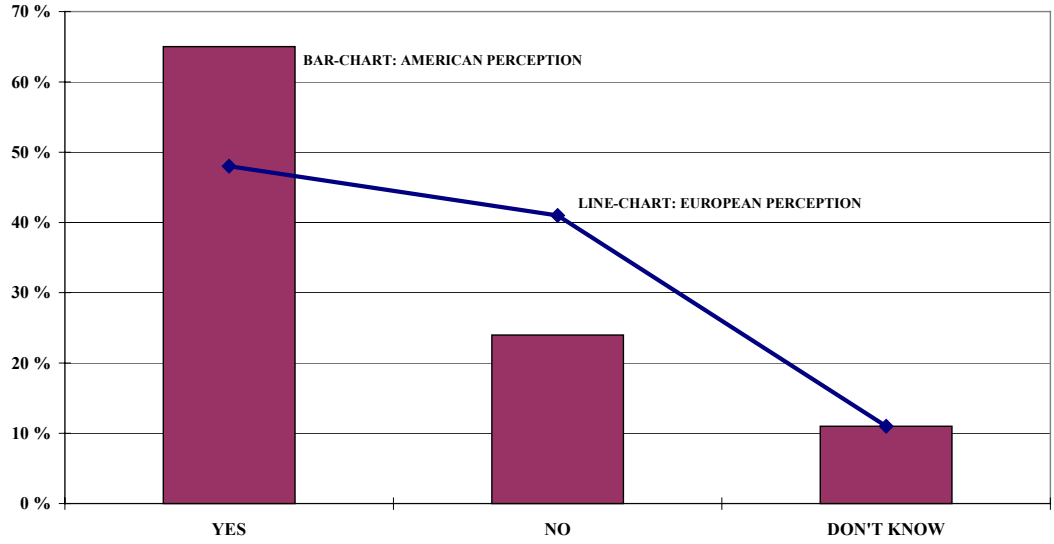
CHART 7:WHICH OPERATING SYSTEM MAY DOMINATE FUTURE OF E-MONEY TECHNOLOGIES?



The European survey demonstrated that more than one-third of the participants believed in more than one operating system in the future. The rest supported particular systems. Here, the picture seems quite different, as the supporters of 'two or more' operating systems increased 21%. There was also much less support for individual operating systems to dominate the future of e-money. As interoperability supports the 'general and immediate acceptance' of e-money, it is expected to play one of the most critical roles in exploiting e-money potential. Scheme operators, as a result, may look for common platforms for PCs, mobile phones, digital TVs, ATMs, hand-held devices etc to support alternative operating systems for each device. Other potential operating systems named by participants were 'Unix' and 'Linux'. The result underlines the importance of interoperability among different e-money schemes in order to sustain acceptability of e-money whenever it is offered.

The question whether banks will remain as the main players in the financial services industry was intended to gather information that will help central bankers to react to the emergence of e-money technologies with regard to its impact on the future of banks within the financial industry. The results are shown below (p-value 0.046).

CHART 8: WILL BANKS REMAIN AS THE MAIN PLAYERS IN THE FINANCIAL SERVICES INDUSTRY?



The European survey indicated that less than the majority of participants believed banks would be able to sustain their central role in the financial industry. In contrast, the second survey clearly suggested that banks would maintain their key position in financial services provision, as almost two-thirds of the innovators and operators in the US pointed to their comparative advantage in financial services, especially as payment system experts. As a result, the US may not experience a real challenge to the dominance of banks in the financial service industry whereas European innovators and operators see better possibilities for non-banks to enter into banking services, especially payment services.

This may also imply a comparative advantage for non-banks to extend their involvement in financial services in Europe. For example, almost all the major supermarket chains in the UK have already started to provide banking services on site, and some European telcos provide a billing service added to telephone bills, allowing telephone account-based crediting. With the advent of mobile and digital TV based technologies, it may not be surprising to see alternative models for the provision of basic banking services. Many distribution channels that now seem highly hypothetical could be realised in the medium or long run. As far as central banks and financial supervisory authorities are concerned, there is a definite need to spend more time and effort investigating possible future financial trends in Europe whereas US innovators and operators are more convinced that banks will maintain their competitive edge over non-banks.

5.2. FINANCIAL REGULATION

So far, the paper has dealt with the major differences between EU and US innovators' and operators' perceptions with respect to e-money. The questions analysed have had p-values of less than 0.06, except for the second question, which was related to the first one. P-values for the rest of the analysis are higher than 0.06, and there seem to be no major differences between European and American perceptions. Consequently, charts will not be employed in the following analysis; comparisons will generally rely on the table in the first appendix. However, the answers will be briefly summarised in the text.

The question about the expected reaction of central banks to e-money developments addresses the differences between the American and European current reactions and tries to quantify the preferences of innovators and operators. The different in the two approaches may be summarised as a 'wait and see' policy in the US vs 'in advance regulation' for European monetary authorities. Question 6 in the first appendix gives the results (p-value 0.179).

According to the results, the majority of the participants expected central banks to regulate e-money in advance on both sides of the Atlantic. The 'Leave it to the market' alternative received the second best support by the innovators and operators. This may imply that differences between regulatory agencies were not quantified by innovators and operators with regard to their first choice, which clearly shows that in advance regulation is expected, but with regard to second best choice there seems to be more support on the American side for a 'wait and see' policy.

Central banks and regulatory agencies may have some difficulty in justifying this clear expectation in favour of in advance regulation for two reasons: First, regulation may be demanded not because of a clear welfare effect but just to clarify the unclear and unsettled standardisation among different e-money schemes and difficulties in the search for common platforms for different e-money proposals. Secondly, the e-money industry may prefer that central banks act as a kind of 'common denominator' for solving the conflicts and arguments with regard to the emergence of e-money so that they can manage the risk of investment loss due to the backing of loosing proposals during the discovery process.

5.3. TECHNICAL ISSUES

The question "Which medium of access technology is most likely to dominate the future e-money developments?" was asked in order to evoke a single choice among alternatives. Question 12 in the first appendix gives the results (p-value 0.082).

In the European survey, the majority of the respondents felt that personal computers would dominate the future access media for e-money. The US survey gave a similar picture, with PC and mobile phone taking the first two places. However, hand-held devices seem to be more popular, and consumer acceptance of such devices appears to be stronger in the US. The same argument may hold for ATM networks, but digital TV does not seem to be as popular as the other alternatives. It can be concluded that the primary access channels for e-money are likely to be PC and mobile phones, supported by hand-held devices in the US and possibly digital TV in the EU area. The overall picture seems to be that the PC (e-commerce) and the mobile phone (m-commerce, including hand-held devices) stand a good chance of dominating in the future, whereas ATMs and digital TV (t-commerce) will likely play a supportive role. Of course these channels may be combined in solutions like personal digital assistants (PDAs) in the future as the technology comes on stream.

Another question addressed the most critical technology for the future success of e-money applications. The aim was to get the views of innovators and operators on the most critical technology for shaping successful e-money rollouts. The p-value for the question was 0.571, so that little difference is indicated vs the earlier surveys.

The European results indicated that smart card technology is perceived as the most critical technology for the future success of e-money proposals. In this survey, smart card technology gained additional support from the American innovators and operators as being the most critical technology, but Internet applications instead of ranking second as for Europe were considered to be just one of the equally important technologies. Participants listed alternative critical technologies as 'Biometrics', 'security, encryption, authentication', 'customer's acceptance', 'retail and POS infrastructure', 'Back Office plus card and terminal management systems' and 'security'. The preference for smart cards by innovators may not be surprising due to the fact that smart cards can be considered to be the only technology that can communicate with all the e-money related platforms, including PCs, mobile phones, digital TVs, ATMs and hand-held devices. They are even capable of integrating game consoles into the above-mentioned network hardware. (appendix 1, question 14)

5.4. FINANCIAL MARKET STRUCTURE

The problem of whether non-financial institutions should be allowed to issue e-money was investigated to address the clear European choice for limiting the issuance of e-money to financial institutions and whether innovators and operators approve this policy choice in the US, where a more liberal policy seems to be preferred with regard to this particular problem.

The majority in Europe favoured allowing non-financial institutions to issue e-money. Only around a third were against non-financial institutions being in the e-money business. American innovators turned out to be less supportive of non-bank issuance of e-money. The results (p-value 0.588) may seem a bit paradoxical in light of the general impression that Americans are less restrictive than Europeans in respect of financial services provision. This may be explained by the stronger support for banks over non-bank in the competition for financial services provision in the US. The 'other' option reflected a question asked by a participant: 'Why not? What is Barter?'. This response may reflect the richness of discussions among innovators and operators, as it addresses the long run implications of e-money for the financial services industry in creating the opportunity to transfer wealth for transaction purposes immediately as part of the medium of exchange function. (appendix 1, question 9).

The question whether e-money technology could reduce barriers to entry to the financial services sector was intended to cover both horizontal entries to new services by financial institutions and vertical entries by non-financial institutions to the banking industry. The question got a p-value of 0.876. In the European survey, a majority believed that e-money technology would reduce barriers to entry. In this survey, the support of this view was 5% less and 25% higher than the 'no' responses. The implications not only for the regulation of e-money but also for the regulation of the whole financial system may be that it might accelerate current trends toward 'functional regulation'. Obviously, a reduction in barriers to entry could also enrich customer choice and stimulate competition and so increase in the overall efficiency of financial services. (appendix 1, question 10).

There was a question about the privatisation of money[13]. It may be argued that private money and free banking experiences began to attract more academicians involved in the discussions after the advent of e-money. The reason may be that as money can be circulated digitally, more choice would

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

be given to the consumers by, for example, backing monetary value with anything from gold to financial or commodity indexes. It may also be easier to define new monetary arrangements like unions or dissolving the unions would become less costly compared to banknote-based circulation of the unit of account. The aim of the question was to investigate the stance of innovators and operators on private money. Question 11 in the first appendix shows the results (p-value 0.134).

The European survey supported, by a majority, the resistance to the privatisation of money. Almost one third of the participants stayed out of the discussion but less than a tenth favoured the privatisation of money. Here in the second survey, the participation of innovators and operators increased in the discussion. Moreover, 14% clearly gave direct support to the privatisation of money.

This result may indicate two policy conclusions. First, it may indicate more support for private monies in the US compared to Europe. This result may not be surprising, as Europe currently has an agenda for monetary union. Secondly, it may show that in two years time the supporters of e-money have increased from 8% to 14%. Either result could concern central banks and other financial authorities as sovereigns of national currencies, and there may be a case for the long run (if not short run) denationalisation of money, as dreamed of by intellectuals for some time now. These relatively small percentages may carry a large weight since privatisation of money would be a great challenge to the status quo, established over many years. This survey made it even much clearer that central bank money is no longer an unchallenged truism.

Interestingly, this result does not necessarily lead to private money as legal tender. The mere possibility that this could happen may put pressure on some central banks, especially in countries marked by a history of high inflation or monetary instability, to pay more attention (sooner) to pursuing sustainable policies oriented toward low inflation. Such a result could not only lead to more stable financial economic areas but it also contribute the global stability of financial markets, since local instabilities can have internationally contagious effects, as exemplified by the latest crises in the Southeast Asia. One participant responded to the question on privatisation of money with the question ‘It already is. Do you really think that Fed is controlled by the government?', with the likely meaning that money is already private in the US as the government has no direct control over the US dollar.

The question ‘What may be the reasons for the failure of alternative e-money proposals like Digicash?’ was aimed at collecting empirical evidence on the reasons why some e-money schemes

(at least their first versions) failed. The p-value was 0.424. In the European survey, nearly half of the participants blamed the lack of co-operation between banks and e-money innovators. The picture did not change much here, as more than 45% of American e-money innovators and operators blamed the lack of co-operation with banks for the failure of early e-money business proposals. Participants mentioned the following reasons as well: 'Difficult to use or program', 'social and cultural inertia', 'lack of secure transactions', 'the consumer', 'privacy and security concerns', 'lack of merchant acceptance' and 'comparison to other e-cash schemes: the best will only succeed'. These results may indicate wide agreement among innovators and operators globally, at least in respect of failures in early e-money proposals. (appendix 1, question 15).

The question 'Which payment instrument is best suited for 'retail' e-commerce transactions?' was aimed to determining whether current payment alternatives can eliminate the demand for e-money arising from retail e-commerce (p-value 0.505). The European survey results suggest that e-money will be a 'demanded or required' medium of exchange, in one way or another, for e-commerce transactions, as 42% of the participants felt that e-money is best suited for such financial settlements. In this survey, e-money seems get stronger support (by a 7% margin) as the main alternative for retail e-commerce transactions. Credit and debit cards, which enjoy strong consumer awareness and understanding, once again failed to surpass e-money as the future payment solution. On the other hand, the latest survey did not name checks and e-gold as alternatives to e-money, and credit and debit cards share the pie (appendix 1, question 16).

One of the questions was 'What may be the impact of e-money on the future of financial services industry?'. It aimed to clarify the impact of e-money on financial institutions with regard to different suggestions ranging from 'no serious impact at all', to 'a serious development similar to the first use of money in very primitive societies' (p-value 0.540). Around a third of the participants believed that e-money will mainly reduce barriers to entry to the financial services industry in the European survey; for the US the figure was 29%. The difference between the American and the European perceptions on this question showed up in the weights given to the 'all' response in the questionnaire, which ranked second in the US compared to fourth in the first survey. On the other hand, as one participant also argued that 'it (e-money) will give banks a new channel for customer relations'. (appendix 1, question 17).

As central banks traditionally rely especially on banks to both collect data for statistical and financial purposes and to provide liquidity to the financial system, banks play a critical role on the conduct of

monetary policy and monetary policy transmission mechanism. As a result, it is critical for central banks to follow and analyse banks and the banking industry for the sake of successful monetary policy implementation, especially for the medium and long run. For example, the monetary transmission mechanism may be influenced or even changed with non-bank involvement in financial services. The question 'Which institutions are best placed to compete with banks in providing e-money schemes?' was intended to find out which institutions are expected to effectively compete with banks in e-money applications. Question 18 in the first appendix shows the results (p-value 0.185).

In the European results, telecommunication companies were given a clear priority, as the majority of participants favoured them as the banks' main competitors. Internet service providers, software houses, and supermarkets and retail chains followed telcos with equal weights. In the second survey, the big picture did change, as less than the majority favoured telcos as the biggest challengers to banks in the provision of e-money and 20% less than in the European survey. The secondary order seems quite changed as 7% more participants in the US favoured Internet service providers, and supermarkets and e-commerce brands also got more support. This implies more diversification as compared to the views of European innovators and operators. Participants also named 'third sector companies', ie 'EDS' and 'voucher companies', as alternative potential e-money scheme operators.

The conclusion as regards policy, specifically in terms of the medium of exchange function of e-money and money in general, may be left to the market, including telcos, as the technology comes in stream. To the extent that central banks ensure that payment system stability is not threatened by market practices, particularly in terms of contagion effects on the store of value and unit of account functions, who provides these services may not be crucial for monetary stability. As a result, telcos and other firms with similar capabilities may be allowed to compete against banks if they can create a customer base with increased service quality under fair competition principles, which will benefit all on the final analysis. This trend finds more support in Europe (by favouring telcos), whereas the US case is diversified among additional alternatives.

As the technology comes on stream, payment systems might become less dependent on the expertise of the financial system. One example of this trend may be the telcos providing alternative payment methodologies, eg Sonera (Finnish Telecom), which allows vending machine operators to vend through telephone numbers, so that the customer is charged via his phone bill. That is why another question addressed the 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'. The comparative table is provided in the first appendix (question 19; p value 0.435).
In the European survey, the participants seemed neutral on the issuers of e-money, as they equally (34%) favoured the 'only banks' and 'any firms capable of handling e-money technology' options. In the US survey, there was strong support for banks as the sole issuer of e-money, as a clear majority of innovators and operators gave them top ranking of the alternative options. The support for banks was 17% more in the US than in the EU.

This result may give a clear advantage to American banks to compete against potential e-money issuers, as they get strong support from innovators and operators. It might additionally imply that American banks enjoy a better reputation in the US among innovators and operators, especially in respect of being potential e-money issuers, compared to European innovators and operators with regard to other companies, as eg telcos. One response, which illustrates the social concerns behind technologic developments, might be worth mentioning here: 'No one, because technology should not control human finance'.

5.5. POLICY ISSUES

The question about the impact of e-money on the ability of central banks to continue as the sole provider of the monetary base addressed the issue arising from the potential of e-money technologies to allow alternative e-money issuance in different forms, eg digital circulation of gold, both as a payment medium and store of value. According to the survey results provided in the first appendix, question 21, in the US more participants seemed to believe that banks could use the benefits of e-money to their own advantage. They did not openly give the same support to central banks. Their view would likely be realised if e-money extends the potential of issuance of currencies in digital form so that it is 'generally and immediately' suitable for PC, mobile phone and digital TV networks globally and that smart card-aided local transactions also be enabled (so that good money can go anywhere in the world, without any limitation on its ability to drive out bad money). Obviously, there was no clear distinction between the EU and US perceptions on this question because the p-value was 0.800.

Another policy issues related question examined whether e-money may lead to a new free banking era. The question also dealt with the main aspects of free banking. The aim of the question was to try to get empirical evidence on the emerging expectations about the re-appearance of a free banking era, mainly via increased computing power and reduced cost of communication.

The European survey results showed that almost half of the participants expect that e-money technology will lead to a new free banking era, even though 20% limit this expectation to a certain extent. In this survey, the participants seemed more concerned about the argument in the first place, as only 11% chose the 'don't know' option. Secondly, the supporters of a free banking era reshaped by the help of e-money technologies was 2% higher and 24% limited this to a certain extent. Those who saw no turning back to free banking amounted to more than a third. The innovators and operators both in the US and Europe expressed a clear expectation of free banking practices in the future and there was no clear difference of opinion here (p-value 0.750; appendix 1, question 22).

The question concerning central banking and money implications of e-money was about the potential for a 'world currency'. Some academicians and practitioners have argued that computers, mobile networks and digital TV networks will create a global economy with no borders that will require a 'world currency' or at least a 'world medium of exchange'. The aim here was to get the opinions of the innovators and operators in the US with regard to these expectations (p-value 0.528).

In the European survey, a slight majority rejected the idea of a 'world currency'. In this survey, the rejection rate for American innovators and operators was 8% lower, and those who believed in the potential emergence of a 'world currency' through the elimination of national currencies amounted to 3% more. One participant argued that his would only be possible with 'IMF's participation'. These differences among European and American innovators and operators might have arisen from local circumstances, as Europe has an agenda for a currency union (euro) whereas the US agenda is a kind of 'dollarisation', especially among Latin American countries. In either case, the confidence among innovators and operators may have serious implications for discussions like 'international lender of last resort', 'sustainability of local currencies after currency unions among major economies' and 'national regulatory policies under international currency era'. Obviously, developing countries may be one of the main sides in these discussions, as their money would be threatened by the availability of superior money.

The last question of the survey investigated the issuance of e-money. It asked participants whether central banks should issue e-money for their own account, thus competing with private banks and/or other institutions. The aim of the question was to obtain guidance on the expectations of the role of central banks in the issuance of e-money. The European results indicated that only a quarter of the participants believed that 'money should only be governed by central banks'. On the other hand,

more than a third of respondents clearly expressed their concerns about central bank involvement in the issuance of e-money. Additionally, almost a quarter of the participants believed in competitive issuance of e-money, arguing that central banks should compete with private issuers in e-money schemes. The results were not radically different from the US results, in which 27% supported only central bank issuance of e-money, whereas 29% were concerned about central bank involvement in e-money issuance. Less than a quarter supported competitive issuance and the percentage of participants who preferred to stay out of the discussion reached 22%, which is the highest for this survey. These results may imply the total rejection of central bank involvement, as innovators and operators who rejected the central bank involvement in e-money issuance exceeded supporters in both surveys on both sides of the Atlantic (p-value 0.522; appendix 1, question 24).

6. CONCLUSIONS AND RECOMMENDATIONS

The first conclusion we might draw is that the potential for e-money to replace central bank money was confirmed by the American innovators and operators as it was by their European counterparts. The same result was reached more than a year ago with the first survey.

This results may put more pressure on central banks and financial service authorities to increase co-ordination for their policy action with regard to the advent of e-money because of its borderless characteristics, a tendency that is already confirmed eg by published BIS survey results (BIS, 2000). Additionally, e-money innovators and operators argued that replacement of currency by digital bits and bites representing monetary value would be realised sooner rather that later. Keeping in mind the very long existence of banknotes and coins in the history of economic development, even 20 to 30 years for full e-money take-off may not be regarded as a ‘long time’.

Innovators and operators in Europe did not regard central bank regulation of e-money as a negative influence on either innovation perspectives for further developments in e-money technology or competition among different operators and innovators. The innovators and operators on the other side of the Atlantic share the same belief but are somehow relatively more concerned than their European counterparts about the negative impact of innovation vs competition, and they are more involved in the discussion.

The main obstacles for e-money to replace central bank money were regarded quite differently in the US and EU. Participants in the European survey stated that technical infrastructure, interoperability,

and costs and profitability for issuers are the main problems, whereas security and privacy are regarded as the leading problems for a successful e-money take-off in the US.

It is likely that the future key access media for e-money will be personal computers in e-commerce and mobile phones in m-commerce, as both of the surveys seem to confirm. However, the differences as between the two surveys is in the priorities. The American side gave more support to ATMs and hand-held devices while the Europeans paid more attention to digital TV technology.

In the European survey, the innovators and operators almost agreed on a combined card and software base as the e-money 'infrastructure' for the future, an opinion which is shared by their US counterparts. There seems to be some differences as to secondary priorities. US participants place less reliance on smart card-related common solutions, but they did feel that virtual and conventional financial transactions might require a combined solution.

The European operators and innovators felt that, instead of a single and dominant medium, the e-money would be shaped by two or even more operating systems. US participants gave this view even stronger support, by a margin of 21%. These results might increase the concern of policy-makers around the world for an interoperability requirement for alternative e-money proposals before the differences in implementation become too complicated to be changed.

The majority of European innovators and operators did not even see banks as the main players in the financial service industry. Once again, the US perception was almost totally different on this issue, as 17% more of the participants gave clear support for banks to defend their positions in the future as the main players in the financial service industry.

Other issues addressed in our questionnaire disclosed closer perceptions among the EU and American innovators and operators. Other than the above-mentioned differences, their opinions did not differ widely. Whereas eight questions underlined different perceptions, the rest of the 24 questions resulted in closer opinions. As an overall conclusion, there seems not to be a clear consensus among innovators and operators in Europe and the US that could form a base for explaining all the differences between the e-money perceptions of the Federal Reserve and the European Central Bank. Similar thoughts, perception and approaches to e-money among innovators and operators clearly surpassed the differences. The differences were mainly limited to the position of banks within the financial industry, access media for e-money, operating systems, innovation and competition-related

issues, the potential e-money issuers and the main obstacles to an e-money take-off. This result may mean that e-money innovators and operators would like to have closer co-operation and co-ordination among European and American central banks in particular and among central banks around the world, in general, in order to develop similar responses to the emergence of e-money. It may be true that when the business practices are somewhat similar and market structures are not radically different, the perceptions as to industry regulation may be expected to be similar or at least not radically different.

The Bank for International Settlements seems to have found a common ground for increasing the level of understanding for the advent of e-money. In the future, it may play a bigger role in sustaining a discussion platform to eliminate (or close the gap between) perceptual differences in order to come some kind of policy consensus. Moreover, there may be an inclination to ask more from central banks around the world (with the increase in the globalisation in financial services provision) in supplying global solutions for global financial services, and it may be that no single policy response will successfully address a particular issue on an independent prescription base. This request may emerge especially from the borderless characteristics of e-money circulating itself in PC, mobile phone, digital TV and hand-held device networks and having the advantage of addressing also conventional payment solutions to conventional transactions by utilising the possibilities of smart cards.

Such a demand may force central banks to work hard to find shared grounds on a sustainable policy reaction to e-money and related issues. We feel that our paper has found a clear demand for a closer policy action on e-money from the central banks, as innovators and operators did not express widely differing perceptions regarding e-money in the surveys discussed here, the differences being largely limited to secondary choices.

7. APPENDIX 1: COMPARATIVE TABLE FOR SURVEY RESULTS				
QUEST: *Major Differences*	**ANSWERS**	**EU**	**US**	**EU - US**
1. Do you think that electronic cash has a potential to replace central bank money?	A) Yes	**35,00**	**63,00**	-28,00
	B) No	18,00	32,00	-14,00
	B) To a certain extent	47,00		
	D) Don't know	00,00	05,00	-05,00
2. If yes, when? (Connected to Question 1)	A) Before 2005	22,00	21,00	01,00
	B) Before 2010	**33,00**	**35,00**	**-02,00**
	C) Before 2015	17,00	16,00	01,00
	D) Before 2020	11,00	10,00	01,00
	E) After 2020	17,00	18,00	-01,00
3. What may be the impact of central bank regulation on innovation regarding e-money technologies?	A) Encourage Innovations	**48,00**	**44,00**	04,00
	B) Discourage Innovations	07,00	21,00	-14,00
	C) Neutral effect on Innovations	29,00	33,00	-04,00
	D) Other	16,00	02,00	**14,00**
4. What may be the impact of central bank regulation on competition among e-money issuers?	A) Encourage competition	**38,00**	**51,00**	-13,00
	B) Discourage competition	11,00	14,00	-03,00
	C) Neutral effect on competition	32,00	34,00	-02,00
	D) Other	19,00	01,00	**18,00**
5. What are the main obstacles for e-cash to replace the central bank's money (or to be widely accepted)? (Please tick all relevant answers)	A) Costs for the customers	17,64	27,84	-10,20
	B) Costs/profitability for the issuers	31,37	26,80	04,57
	C) Security	25,49	**55,67**	**-30,18**
	D) Privacy	21,57	44,33	-22,76
	E) Interoperability	41,18	24,74	16,44
	F) Legal framework	19,61	25,77	-06,16
	G) Technical infrastructure	**47,06**	34,05	13,01
	H) Cross-border issues	23,53	34,02	-10,49
	I) Critical mass of customers	25,49	27,84	-02,35
	J) Others	17,65	04,12	13,53
7. What is the base for e-money schemes of the future?	A) Card based	27,00	14,00	13,00
	B) Software based	02,00	02,00	00,00
	C) Combined card and software based	**61,00**	**54,00**	07,00
	D) All of the Above	10,00	27,00	**-17,00**
	E) Other	00,00	03,00	-03,00
8. What 'access' medium for e-money will be used the most in the future by the customers? (Tick all relevant answers)	A) Public telephone	33,33	31,96	01,37
	B) Home telephone	52,94	32,99	19,95
	C) Mobile telephone	56,86	63,92	07,06
	D) Television	39,22	31,96	07,26
	E) PC	**66,67**	**73,20**	-06,53
	F) Public 'ATM'	35,29	62,86	**-27,57**
	G) Other	13,73	05,15	08,58

QUEST: *Major Differences*	ANSWERS	EU	US	EU - US
13. Which operating system may dominate the future of e-money technologies?	A. Multos	19,00	07,00	12,00
	B. Java	24,00	20,00	04,00
	C. Windows for Smartcards	18,00	10,00	08,00
	D. None of the above but	00,00	03,00	-03,00
	E. There will be two or more operating systems	**39,00**	**60,00**	**-21,00**
20. Will banks remain as the main players in the financial services industry?	A. Yes, they can supply financial services more efficiently than other firms	**48,00**	**65,00**	**-17,00**
	B. No, other firms have been gaining comparative advantages especially in digital economy	41,00	24,00	17,00
	C. Don't know	11,00	11,00	00,00
QUESTIONS: *Regulation*	**ANSWERS**	**EU**	**US**	**EU - US**
6. What should be the reaction of central banks to e-cash?	A) In advance regulation for guidance	**56,25**	**57,45**	-01,20
	B) Wait and See	04,17	13,83	**-09,66**
	C) Leave it to the Market	35,42	27,66	07,76
	D) Other	4,17	01,06	03,11
QUESTIONS: *Tech. Issues*	**ANSWERS**	**EU**	**US**	**EU - US**
12. Which medium of access technology is most likely to dominate the future e-money developments?	A. Personal computer (PC)	**42,86**	**38,95**	03,91
	B. Mobile telephone	32,86	28,42	04,44
	C. Palm	04,29	11,58	-07,29
	D. Digital TV	18,57	08,42	**10,15**
	E. Automated Teller Machine (ATM)	02,86	10,53	-07,67
	F. Other	04,29	02,11	02,18
14. What is the most critical technology for the future (success) of e-money?	A. Smart Cards	**30,00**	**34,07**	-04,11
	B. Internet Applications	25,71	14,29	**11,42**
	C. Wireless Application Protocols for mobile phones	10,00	10,99	-00,99
	D. Digital TV	04,29	01,10	03,19
	E. Palm	00,00	01,10	-01,10
	F. Operating Systems like Java, Multos, Windows for Smartcards	05,71	08,79	-03,08
	G. All of the above	17,14	21,98	-04,84
	H. None of the above but	11,43	07,69	03,74

QUESTIONS: ***Financial Markets Structure***	ANSWERS	EU	US	EU - US
9. Should institutions other than banks be allowed to issue e-money?	A) Yes	**50,00**	39,00	**11,00**
	B) No	36,00	**43,00**	-07,00
	C) Don't Know	14,00	17,00	-03,00
	D) Other	00,00	01,00	-01,00
10. Do you think e-money schemes can decrease barriers to entry to the banking industry?	A) Yes	**51,00**	**46,00**	**05,00**
	B) No	21,00	21,00	00,00
	C) Neutral	15,00	19,00	-04,00
	D) Don't Know	13,00	14,00	-01,00
11. Should money be privatised?	A) Yes	08,00	14,00	-06,00
	B) No	**61,00**	**69,00**	-08,00
	C) Don't know	31,00	14,00	**17,00**
15. What may be the reasons for the failure of alternative e-money proposals like Digicash? (Please tick all the relevant answers)	A. Lack of demand for e-money	20,00	15,12	04,88
	B. Lack of business case for e-money	17,14	09,30	07,84
	C. Lack of coordination with banks and operators	**51,43**	**46,51**	04,92
	D. Lack of investment and advertisement	08,57	03,49	05,08
	E. Lack of expertise and management skills	10,00	01,16	**08,84**
	F. Exaggerated expectations	14,29	06,98	07,31
	G. Unsustainable cost of infrastructure to get critical mass	10,00	10,47	-00,47
	H. Other	08,57	06,98	01,59
16. Which payment instrument is best suited for 'retail' e-commerce transactions?	A. E-money	**42,00**	**49,00**	**-07,00**
	B. Credit cards	36,00	31,00	05,00
	C. Debit cards	20,00	20,00	00,00
	D. Checks	01,00	00,00	01,00
	E. E-gold	00,00	00,00	00,00
	F. Other	01,00	00,00	01,00
17. What may be the impact of e-money on the future of financial services industry?	A. E-money will allow financial institutions to issue their own money	04,29	05,81	-01,52
	B. It will only increase the efficiency and productivity of financial service providers	28,57	20,93	07,64
	C. It will decrease barriers to entry to the financial service industry by reducing operating and managerial cost and increase competition	**31,43**	**29,07**	02,36
	D. Technology companies will gain comparative advantage for financial services	20,00	12,79	07,21
	E. All of the above	15,71	24,42	**-08,71**
	F. It will have no impact	02,86	05,81	-02,95
	G. None of the above but other	02,86	01,16	01,70

QUESTIONS: *Financial Markets Structure*	**ANSWERS**	**EU**	**US**	**EU - US**
18. Which institutions are best placed to compete with banks in providing e-money schemes? (Please tick all the relevant answers)	A. Telecommunication companies like BT and Vodafone	**62,86**	**43,30**	**19,36**
	B. High-tech companies like IBM	10,00	18,56	-08,56
	C. Internet service providers like AOL	28,57	35,05	-06,48
	D. E-commerce brand names like Amazon.com	15,71	20,62	-04,91
	E. Software companies like Microsoft	28,57	18,56	10,01
	F. Supermarkets and retailer chains like Wal-Mart and M&S	28,57	23,71	04,86
	G. Other	01,43	04,12	-02,69
19. Who should be allowed to issue e-money?	A. Only Banks	**34,29**	**51,09**	**-16,80**
	B. Only Telecommunication companies	05,71	03,26	02,45
	C. Only Internet Service Providers	01,43	01,09	00,34
	D. Only Software companies	01,43	00,00	01,43
	E. All of the above	20,00	13,04	06,96
	F. Any firms capable of handling e-money technologies	34,29	30,43	03,86
	G. Other	01,43	01,09	00,34
QUESTIONS: *Policy Issues*	**ANSWERS**	**EU**	**US**	**EU - US**
21. 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	23,00	24,00	-01,00
	B. No	**37,00**	**39,00**	-02,00
	C. To a certain extent	34,00	29,00	**05,00**
	D.Don't know	06,00	09,00	-03,00
22. 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	28,00	26,00	02,00
	B. No	**33,00**	**39,00**	-06,00
	C. To a certain extent	20,00	24,00	-04,00
	D. Don't know	19,00	11,00	**08,00**
23. Can e-money create a 'world currency' by eliminating most of the currently available national currencies all around the world?	A. Yes	35,00	38,00	-03,00
	B. No	**52,00**	**44,00**	**08,00**
	C. Don't know	13,00	18,00	-05,00

QUESTIONS: *Policy Issues*	ANSWERS	EU	US	EU - US
24. Should central banks issue e-money for their own account, thus competing with private banks and/or other institutions?	A. Yes, money should only be governed by central banks	26,00	27,00	-01,00
	B. Yes, all firms including central banks should compete with each other in e-money schemes	24,00	22,00	02,00
	C. No, central banks should not compete with financial services providers	**34,00**	**29,00**	05,00
	D. Don't know	16,00	22,00	**-06,00**

8. APPENDIX 2: TABLE OF ASSOCIATION (CHI-TEST)

QUESTIONS (Numbered as the questionnaire)	P-VALUE[14]
4. What may be the impact of central bank regulation on competition among e-money issuers?	**0,001**
5. What are the main obstacles for e-cash to replace the central bank's money (or to be widely accepted)? (Please tick all relevant answers)	**0,002**
3. What may be the impact of central bank regulation on innovation regarding e-money technologies?	**0,005**
13. Which operating system may dominate the future of e-money technologies?	**0,015**
7. What is the base for e-money schemes of the future?	**0,039**
20. Will banks remain as the main players in the financial services industry?	**0,046**
8. What 'access' medium for e-money will be used the most in the future by the customers? (Tick all relevant answers)	**0,058**
12. Which medium of access technology is most likely to dominate the future e-money developments?	*0,082*
11. Should money be privatised?	*0,134*
6. What should be the reaction of central banks to e-cash?	*0,179*
18. Which institutions are best placed to compete with banks in providing e-money schemes? (Please tick all the relevant answers)	*0,185*
15. What may be the reasons for the failure of alternative e-money proposals like Digicash? (Please tick all the relevant answers)	0,424
19. Who should be allowed to issue e-money?	0,435
16. Which payment instrument is best suited for 'retail' e-commerce transactions?	0,505
24. Should central banks issue e-money for their own account, thus competing with private banks and/or other institutions?	0,522
23. Can e-money create a 'world currency' by eliminating most of the currently available national currencies all around the world?	0,528
17. What may be the impact of e-money on the future of financial services industry?	0,540
14. What is the most critical technology for the future (success) of e-money?	0,571
9. Should institutions other than banks be allowed to issue e-money?	0,588
22. Can e-money technologies lead to a 'free banking' era (A system of competing currencies issued by various institutions and without a Central Bank)	0,750
21. 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)?	0,800
10. Do you think e-money schemes can decrease barriers to entry to the banking industry?	0,876
2. If yes, when? (Connected to the first question)	0,999

[14] P-Value implies a close association as it gets closer to 1 and opposite when it is close to 0.

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