Technology Assessment and Electronic Money – Between Consultancy and Oversight

Knud Böhle[*]*, Michael Rader, Ulrich Riehm, Arnd Weber*
Forschungszentrum Karlsruhe
Institut für Technikfolgenabschätzung und Systemanalyse (ITAS)

Six technology assessment (TA) projects dealing with the payment innovation "electronic money" carried out between 1996 and 1999 in Austria, Germany, the United States and for the European Parliament are compared leading to recommendations for future projects in the field characterised by rapidly changing technological innovation.

Introduction

In the following we look at six TA projects about "electronic money" carried out between 1996 and 1999 (Table 1 on the next page provides a formal overview of these projects). The aim is to learn from these experiences for future TA projects. We are interested to find out about the type of TA applied, how these projects cope with the rapid technological change in the field, and how the cultural and regional contexts influenced the analysis. We close this essay with suggestions to be considered in future projects. The basis of our analysis are the project publications and communications with researchers and clients involved in these studies (see acknowledgements). We would like to thank them for their support. Before we get to the projects we will define the essence of the innovation called "e-money" and outline technical developments along with the concerns (risks and opportunities) it created.

E-money: innovation and concerns

The innovation called "electronic money" is first of all determined *ex negativo* as different from "access products", i.e. different from those payment instruments permitting the electronic transfer of money from one account to another (mainly direct debits, credit card payments, credit transfers). Expressed positively, paying with e-money does not necessarily require a current account; while paying, no online-authorisation is required; payments can in principle be made without keeping records of all transactions, and even anonymous payment instruments can be designed. To the extent that e-money can be used for payments on open networks it is also suitable for e-commerce and remote payments. In technical terms, advances in cryptography and smartcard technology have enabled this new type of payment instrument. In terms of business considerations cost savings were expected by replacing cash and by reducing communication costs (no online authorisation); float earnings were expected, because usually (not necessarily) e-money has first to be loaded against cash or funds from a current account at the same time providing the issuer with an interest free credit. Consequently the final payment claim of third parties (eg merchants) is directed towards the issuer. In this perspective e-money seems to be an interesting although not breathtaking innovation for retail payments (for a discussion of e-money definitions see

Abbreviation	STOA (EU)	ITA (USA)	ITAS (Germany)	BSI/ISI (Germany)	IPTS/ESTO (EU)	Austrian Academy of Sciences (Austria)
Title	Technological innovation and money	Digital money: Industry and public policy issues	Technology assessment of Internet payment systems for digital products and services	Electronic payment transactions – Consequences of absent or insufficient IT-security	European Monetary Union and information Society. About the opportunity to combine Euro with new payment technology	The future of money in Europe: Monetary policies for the information society
Client/ funding	Scientific and Technological Options Assessment Program (STOA) of European Parliament	Directed at Congress (but not client)/self-funded	German Ministry of Education and Research	TA unit of BSI (German governmental Information Security Agency)	Committee on Economic and Monetary Affairs and Industrial Policy of the European Parliament/ESTO funding	"jubilee fond" of Austrian National Bank
Contractor	University Girona (UDG), Spain	Institute for Technology Assessment (ITA), Washington	Institute for Technology Assessment and Systems Analysis (ITAS), Karlsruhe	Fraunhofer-Institute for Systems and Innovation Research (ISI), Karlsruhe	Institute for Prospective Technological Studies (IPTS), Seville + European Science and Technology Observatory (ESTO)	Austrian Academy of Sciences (2 institutes)
No. of staff involved	5 (interdisciplinary)	2 (lawyer/analyst)	2 (social scientists)	5 (interdisciplinary)	16 persons working in ESTO member organisations	6 (interdisciplinary)
Duration	Sept. '96 - Feb. '97	Sept. '96 - Feb. '97	Jan. '97 - Dec. '98	Jan '97 - Feb. '98	Oct. '98 - Sept. '99	Jan. '98 - Jul. '99
Methods	– Desk research – Expert Interviews – Round tables	– Desk research – Workshop	– Desk research – Expert Interviews – Electronic discussion Forum + Electronic newsletter	– Desk research – Three "discourse" events (workshops)	– Desk research – International Expert survey – Expert Interviews in different countries by ESTO partners	– Desk research – Computer simulation
Main publication	Valls et al. 1997	Bonorris 1997	Böhle and Riehm 1998	BSI 1998	Papameletiou 1999, Böhle, Rader, Riehm (Eds.) 1999	Hanappi et al. 1999

Table 1: Formal description of e-money studies

Böhle and Riehm 1998, p. 142ff). A short historical sketch helps to explain the excitement about e-money and why TA studies were required at a given stage of development.

In the late seventies and eighties *non-banks* started issuing prepaid single purpose stored value cards (of the telephone card type) and prepared the grounds for e-money for use as a more general prepaid payment instrument (often called e-purse) to pay third parties (see Kubicek and Klein 1995). These developments revived the vision of a *cashless society* that stemmed from the early days of electronic funds transfer systems. Expectations that cash replacement would take place rapidly with the advent of e-purses were not so seldom in those days, to quote just a statement given at CeBit '98 that e-money would "wipe out cash in Europe" (see Craig 1998). As old as the vision of e-money as cash replacement – criticised convincingly by Goldfinger (1999) –, is the fear that electronic payment systems can be abused for surveillance purposes. Anecdotal evidence is provided in Foy (1975) that security experts when asked to invent a not-too-obtrusive control mechanism proposed precisely electronic funds transfer systems. E-purses increased this fear in so far as now even small payments were exposed to the danger to be recorded and analysed to produce precise behavioural profiles (*big brother*). At this stage however the major concern was probably the fact that *non-banks* had started issuing e-money (eg Danmønt in Denmark) and that the banking sector and monetary authorities felt a need to figure out the appropriate type of regulatory or legal action and the consequences e-money might have on monetary policy and the monetary system at large. The European Monetary Institute proposed restricting the issuance of e-money to banks (EMI 1994). This position was not shared by all central banks and criticised from outside (eg Grigg 1996). The debate on *regulation and innovation* has not stopped since then (cf. Krüger 2001). In other words, the e-money debate is also about the *liberalisation of the financial service industries.* Last not least e-money raised concerns of *technical security and crime.* Especially the Mondex electronic purse issued by the NatWest bank and piloted in Swindon 1995, fuelled the debate about security as it enabled purse to purse transactions and appeared to have most properties of genuine circulating electronic cash.

These debates extended and gained considerable heat when the Internet turned out to be suitable not only for communication but also for online transactions including payments. The aforementioned concerns became worries, portraying the danger of *privately issued* e-money in *offshore havens* flowing *anonymously* a*cross borders* and not subject to any regulation or control. A catalyst for this out-of-control-scenario was to a great extent the eCash scheme (developed by the DigiCash company), piloted in 1994. The new technology is also thought to leverage old visions to change the incumbent banking system, for example by *free banking* (cf. Matonis 1995 along the lines of F. A. Hayek), or by visions of *green money* (cf. Rheingold 1997 with reference to Lietaer). The banking sector reacted by aiming to keep control at the regulatory level (cf. BIS 1996a, BIS 1996b; ECB 1998) and in practice by adding security to the card payment schemes for internet payments. Some banks also started to incorporate the schemes of the newcomers. At a pragmatic level the question of whether *new payment systems are required to make e-commerce happen* is posed and more specifically the question of the role that e-money can play.

The *European Monetary Union (EMU) and the introduction of the Euro* added a dimension of e-money related concerns. In this context, three questions are central: first, in how far e-money can help to introduce the new currency and strengthen the EMU (eg

the idea of a "smart Euro" in existence since 1990; see Kommission der Europäischen Gemeinschaft 1990). Second the falling national borders automatically create problems of interoperability within the new payment area including e-money schemes, and, third, from the perspective of a common market, competition in the financial sector hopefully leading to more efficient payment systems is a major concern of European policies. It is at this stage and against this complex background that TA projects on e-money are launched. These will next be described briefly.

Sketch of the projects

STOA project

The 1996 work plan of STOA, the Scientific and Technological Options Assessment Program of the European Parliament, included a project about “Technological Innovation and Money”, and a research team of the University of Girona was selected after a restricted call for tenders. Originally, the project had been proposed to the STOA panel by the Committee on Economic, Monetary and Industrial Policy Affairs, and in particular by its Monetary Affairs Subcommittee. At that time there was a debate on the cashless society, which was encouraged by MEP John Stevens. One of the key issues for Mr. Stevens was a discussion of the advantages that a quick diffusion of e-money systems (in particular e-purses) could have in pushing the Euro introduction/diffusion process. The main goal of the project was to analyse the challenges posed by electronic money for regulators and policy makers, and in particular the opportunities created by two simultaneous processes: The Economic and Monetary Union and the increasing use of electronic money and new payment systems. The authors stress legal regulation of e-money issuers and standardisation, harmonisation, and interoperability efforts by policy makers and point at the risks of uncontrolled creation of money, tax evasion, and problems of cash supply. In short, they envisage multiple tasks for European policy makers and regulators.

ITA project

In 1995 OTA, the Congressional Office of Technology Assessment, completed a project on *Information Technology for Control of Money Laundering*. During the course of that study awareness was created of the potential threat of money launderers using the then just emerging technology of digital money or e-cash. OTA indicated interest in a further study of digital money, but was closed before it could be approved. A private research institute ITA (Institute for Technology Assessment) was founded by former OTA staff and carried out the project on digital money without client. Like OTA work, the study depended heavily on an initial workshop with stakeholders and constant outreach and consultation from experts in government, industry, and academia. However, there was a general lack of public interest in and information about the potential (good and bad) of digital money. Major concerns stressed by ITA were money laundering, tax evasion, and offshore issuing of e-money. ITA recommended monitoring developments to be able to put law enforcement against criminal practices in place, when needed; but no regulation of e-money-issuers was demanded. Other recommendations were to beware sub-optimal standards and to avoid being forced to adopt European standards.

ITAS Project

Based on a suggestion from the TA department of the Germany Federal Ministry of Education and Research, an analysis of the current state and foreseeable trends in the field of electronic payment systems in the context of e-commerce was performed by the Institute for Technology Assessment and Systems Analysis (ITAS) of Karlsruhe Research Centre. Funding started at the beginning of 1997. Apart from desk research, empirical research consisting of a series of 37 interviews with the most relevant groups (technology providers, merchants, consumers, trade unions, financial services industry, regulators, scientists and consultants) was carried out. An important additional methodological feature of the project was the production of a widely circulated electronic newsletter (two issues per month) and the setting up of an e-mail based discussion list. In some cases, this served to draw attention to positions which might otherwise have been ignored in the discourse process on electronic payment systems. The discussion list continued its existence beyond the end of the project up to the present with now more than 1,000 subscribers. Starting from the assumption that a lack of suitable payment systems was a barrier to the spread of e-commerce, a genuine lack of new payment systems was identified only for the segment of small-value and micro-payments. Among the study's recommendations were further research into the needs of consumers and a shift of attention of policy-makers from payment schemes to payment systems infrastructure.

BSI/ISI Project

In the light of ongoing public debate about electronic money, the department of BSI (German Governmental Information Security Agency) concerned with technology assessment launched a call for tenders in 1996. In January 1997 the Fraunhofer Institute for Systems and Innovation Research (ISI) was commissioned to carry out a study focusing on the consequences of insufficient IT-security of electronic payment systems. Security was understood in a broad sense including technical, organizational, legal, and social aspects. In addition further TA related questions were treated, such as control of money supply, money laundering, regulation or media-competencies of payment system users. A range of external experts, representatives of the financial industries, and also consumers participated in a series of workshops in accordance with the "discourse-orientation" of the commissioning BSI unit. The study asks for political action (especially to build trust and to create media-competency) to leverage the potential of electronic payment systems and at the same time to regulate them appropriately. The study also opened the debate about e-money and presented alternative options, especially with respect to the regulation of e-money issuers.

IPTS/ESTO Project

1998 in the context of the upcoming introduction of the Euro, with the idea of a smart Euro still pending, and a legal regulation of e-money issuers in preparation, a committee of the European Parliament requested a study on electronic money to be undertaken by IPTS, the Institute for Prospective Technological Studies of the European Union's Joint Research Centre in Seville. Apart from the focus on the European Monetary Union expectations that electronic commerce would need electronic currency to flourish were of interest at that time. The Parliament therefore asked, among other questions, whether

e-commerce needed a widespread payment system, and how issuers of electronic money should be regulated. IPTS enlisted the support of ESTO, the European Science & Technology Observatory, a network of research organisations in the member countries. ESTO focused on country reports, with the objective of analysing national settings, IPTS carried out an expert mail survey with more than 80 experts responding. The studies found that for e-commerce, the traditional national payment instruments are usually dominant. It was also pointed out that a right of cancellation is of particular importance to encourage the take-up of on-line orders. Regarding e-money regulation, permitting non-banks to issue e-money was expected to favour innovation. The findings were discussed at a workshop in 1999. The study created a demand by the European Parliament to be informed continuously about the subject and had the effect that European Parliament and Commission agreed to support an "electronic Payment Systems Observatory" to conduct empirical and analytical work, which is now up and running (http://epso.jrc.es).

Austrian Academy of Science Project

This project is in some ways different from the others sketched above. Researchers from the Austrian Academy of Sciences (Österreichische Akademie der Wissenschaften) had e-money in mind as a project since 1996, but it took until 1998 to raise funds (Jubiläumsfond der Österreichischen Nationalbank). Although the study had no direct client and was not directly related to the political decision making process, its interdisciplinary approach and its scope covering the technical, social and legal dimensions of e-money made it comparable with the other TA studies. The project started in 1998 and was finished in mid-1999. The diagnosis identifies a demand to adapt Austrian legal regulations to developments in the European Union. Requirements for e-money systems are put forward, such as anonymity, mobility, or independence of accounts. The impact of this study on public debate has to be regarded as limited as the book publication planned did not materialise.

Results of the comparison

Location on the TA continuum

So-called "expert TA" compiles expert opinions on technology-related issues with results intended for use by political decision-makers. The classic TA concept has frequently been subjected to criticism and modified in response (cf. Meyer 1999). There have been demands to address the findings of technology assessment studies to broader audiences, and it has also frequently been argued that to be useful, technology assessment could play a major role in organising a dialogue or a discourse on technology, its application and impacts, involving all stakeholders and other parties concerned.

The studies examined here, include three examples of "classic TA" in as much as they were commissioned by parliament (STOA, IPTS) or intended for parliament (ITA). The two studies (ITAS, BSI/ISI) carried out on behalf of governmental bodies (Ministry, Information Security Agency) addressed a wider audience either by commercial publication of their report (BSI/ISI) or by making the deliverables available free on a project web-site (ITAS). These projects also contained discourse elements, the BSI/ISI project by explicitly organising so called "discourse-events" and the ITAS project by the

establishment of an electronic discussion list (EZI-L). The ITAS approach was later adopted at the European level in the ePSO project.

Decision-making process and the timeliness of the studies

The most obvious political decision to be taken in those years was if and how e-money issuers should be regulated. In Germany for example the "Kreditwesengesetz" (defining banking businesses) was about to be amended and the European Commission had prepared a proposal for a Directive on Electronic Money Institutes, envisaged as lightweight and specialised type of credit institution. Legislation was influenced by the expert opinion of the monetary authorities, but was not explicitly the subject of technology assessment – although regulation of e-money is dealt with in all studies examined. But it is one topic among others and not linked with concrete legislation. To this extent, these projects were released from the pressure of providing timely support for decision making. While it is obviously desirable for political decision-makers to attempt to regulate important technological developments before their widespread application, the question of how TA can support such "pro-active" legislation is unresolved. Be that as it may, one has to keep in mind that e-money was (and still is) at an early state of development and therefore there is a need for exploratory and future oriented studies, and maybe also for the organisation of awareness and dialogue. The major challenge for this type of studies may not be "timeliness", but how to cope with rapid technological change and permanent restructuring of the fields and blurring borders. One element of the answer to this challenge was given by the ITAS project: The organisation of permanent open fora for structured discussion and exchange of opinions among participants of different fields – enabled by electronic communication means.

Cultural and regional context

It is obvious that the demand for an assessment of e-money was less urgent in the United States, given that the phenomenon was considerably less developed than in Europe (the first trials of e-purses, Olympic games in Atlanta, and Mondex/VisaCash pilot in Manhattan, had just started) and the official policy of the Federal Reserve (cf. Greenspan 1997) was definitely not to hamper innovation by regulation. In Germany, taken here as an example of a nation state, banking oversight and legislation took their own initiative to strengthen the position of banks as the single legitimate issuers of e-money, while the demand for TA studies is derived from the new phenomenon "e-commerce" and its need for adequate payment instruments. Although the BSI study is more focused on security issues its general orientation is towards e-commerce. The European Commission and the European Parliament undoubtedly have the most acute political interest in TA given the tasks ahead (already mentioned above). The political dimension is correspondingly rather pronounced in the studies commissioned. Given the complexity of problems one must however argue that the STOA project as well as the IPTS/ESTO project were too small to have a noticeable political impact or were not sufficiently focused.

Lessons

Most of findings of the studies reviewed are still of interest since the basic concerns have not changed in the last three years or so: regulation is still a topic, interoperability needs as well, and also crime prevention, law enforcement, and security. The concern however that e-money will have significant effect on monetary policies and the monetary system seems to have disappeared. One might think that due to the low use of bank-issued e-money cards, e-money will also be of low significance in the future. It must be noted, however, that both banks and non-banks keep deploying such schemes for vending machines, and in particular for public transport. It must also be noted that the mobile telecom companies have had success with prepaid schemes for telephony. There is a possibility that such schemes will be extended to things like parking, and also to purchases of digital goods. Thus, the subject of analysis is by no means dead. Asked what additional issues would have to be dealt with if the TA project started today, the researchers pointed at the need to consider more types of stakeholder, include new technological and organisational developments, and to pay more attention to the international aspect. The lesson can be resumed in one sentence: keep pace with technological developments, don't stop at the surface of products and brands, have a look at the underlying infrastructure, keep pace with the expanding financial service industry, think internationally and don't forget the users, meaning the consumers and merchants.

Benefits of TA

The main types of organisation concerned with analysing electronic payments are consultants and banking authorities. While consultants tend to see their task as making recommendations on the optimum use of technology within applications, banking organisations tend to focus on the implications that an innovation such as electronic money may have for the established order, in particular on threats it might pose. Technology assessment studies have usually proved sufficiently sensitive in their analysis to focus on societal issues related to technological innovation and have helped to demystify technology and to take away the hype.

Suggestions

- If TA projects are to directly support the political decision-making process they have to be very specific (eg "smartEuro", "EMI-directive") and at the same time be provided with sufficient resources to ensure a professional level in complicated matters. In some cases participation in industrial initiatives (eg open industry groups, standardisation bodies) will be required to meet this objective.
- The rapid technological change and the blurring boarders between sectors can be coped with partly by electronic means of communication used to raise awareness and to enable structured discussion. This includes communication cross borders as well as across political or administrative departments in a single building, and it includes international communication between researchers.

– TA should have a clear sense of the timing of technological developments, distinguishing between short term problems and the long-term structural changes of society. It can be helpful to link the investigation of rapidly changing technical innovation (like e-money) to the relatively time-consuming change of sectors and branches (like the financial service industries). Empirical research might be especially helpful with regard to short term problems, while technology foresight and scenario techniques can improve long term analysis.

Acknowledgements

The following persons supported us kindly by personal communications: Jaume Valls, Anna Arbussá (both University of Girona, Spain), Vary Coates (Institute for Technology Assessment, Washington), Frank Schlie-Roosen, Thomas Roth (German Ministry of Research), Pia Karger (BSI), Peter Zoche (ISI), Demosthenes Papameletiou (IPTS, Seville), Peter Troberg (European Commission), Alman Metten (MEP), Hardy Hanappi, (TU-Vienna), Walter Peissl (Institute of Technology Assessment of the Austrian Academy of Sciences). Affiliations are those of the time when the projects took place.

Notes

* Knud Böhle is at present visiting scientist at the JRC Institute for Prospective Technological Studies (IPTS), Seville, working for the electronic Payment Systems Observatory (http://epso.jrc.es).

Bibliography

BIS (Bank for International Settlements) 1996a
Implications for Central Banks of the Development of Electronic Money. Basle: 1996

BIS (Bank for International Settlements) 1996b
Security of electronic money. Basle: 1996

Böhle, Knud and Ulrich Riehm 1998
Blütenträume – Über Zahlungssysteminnovationen und Internet-Handel in Deutschland. Karlsruhe: Forschungszentrum Karlsruhe 1998 (Wissenschaftliche Berichte FZKA 6161 http://www.itas.fzk.de/deu/Itaslit/bori98a.pdf)

Böhle, Knud; Rader, Michael; Riehm, Ulrich (Eds.) 1999
Electronic Payment Systems in European Countries. Country Synthesis Report. Karlsruhe: Forschungszentrum Karlsruhe 1999 (http://www.jrc.es/pages/projects/docs/Final-EPS-Vol.1.pdf)

Bonorris, Steven 1997
Digital money. Industry and public policy issues. Washington D.C.: ITA 1997

BSI (Bundesamt für Sicherheit in der Informationstechnik) 1998
Elektronischer Zahlungsverkehr – Folgen fehlender oder unzureichender IT-Sicherheit. Ingelheim: SecuMedia 1998 (Erarbeitet. vom Fraunhofer-Institut für Systemtechnik und Innovationsforschung (ISI))

Craig, A. 1998
E-Money expected to wipe out cash in Europe. In: TechWeb. Technology News. 23. 3. 1998

ECB (European Central Bank) 1998
Report on Electronic Money. Frankfurt/M.: 1998.

EMI (European Monetary Institute) 1994
Report to the Council of the European Monetary Institute on Prepaid Cards, by the Working Group on EU Payment Systems. Frankfurt/M.: 1994.

Foy, Nancy 1975
EFT: customer privacy or bank security? The Bankers' Magazine, Dec. 1975, p. 7-9

Goldfinger, Charles 1999
Economics of financial applications of the smart card: a summary overview. Brussels: 1999 (http://www.ispo.cec.be/fiwg/fasc.htm)

Greenspan, Alan 1997
Fostering financial innovation: the role of government. In : Dorn, J.A. (Eds.): The future of money in the information age. Washington D.C.: Cato 1997, p. 45-50

Grigg, Ian 1996
Critique on the 1994 EU report on prepaid cards. 1996
http://www.systemics.com/docs/papers/1994_critique.html)

Hanappi et al. 1999
Hanappi, H.; Jaburek, W.; Sint, P.-P.; Hanappi-Egger, E.; Peissl, W.; Katsikides, S.: Die Zukunft des Geldes in Europa: Geldpolitik in der Informationsgesellschaft. Wien: TU Wien 1999

Kommission der Europäischen Gemeinschaften 1990
Diskussionspapier Zahlungsverkehr im Binnenmarkt. Brüssel: 26.9.1990

Krüger, Malte 2001
Innovation and Regulation – The Case of E-Money Regulation in the EU. Seville: Electronic Payment Systems Observatory (ePSO) 2001 (Background Paper No. 5., http://epso.jrc.es)

Kubicek, Herbert und Klein, Stephan 1995
Wertkarten im Zahlungsverkehr: Trends und Perspektiven auf dem Weg zur elektronischen Geldbörse. Wiesbaden: Gabler 1995

Matonis, John, W. 1995
Digital Cash and Monetary Freedom. Paper presented at INET '95 Internet Society Annual Conference available at:
http://www.eff.org/Privacy/Digital_money/matonis_on_dig_cash.paper

Meyer, Rolf 1999
Eine kurze Geschichte der TA-Konzepte. TAB Brief No. 17, Dezember 1999, 4 –11

Papameletiou, Demosthenes 1999
Study on Electronic Payment Systems for the Committee on Economic and Monetary Affairs and Industrial Policy of the European Parliament. Brussels and Luxembourg: 1999 (http://www.jrc.es/pages/projects/docs/ESTOCSRfinal.pdf)

Rheingold, Howard 1997
The Internet and the Future of Money at
http://www.transaction.net/press/tomorrow.html

Valls et al. 1997
Valls, J.; Torres, R.; Arbussa, A.; Ormazábal, G.; Tarrés, M.; Anguera, J.: Technological innovation and money. Final Report. Working document for the STOA PANEL. Luxembourg: Eu-ropean Parliament, Directorate General for Research 1997 (PE number: 166.483)