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Electronic Cash and the Virtual Marketplace: Reflections on a Revolution Postponed

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Abstract. *By the late 1990s the notion of the 'virtual' had become a key term in attempts to render meaningful the changes being brought about by new information and communication technologies on extant forms of enterprise and organizing. Many commentators had already identified the financial services sector as a site where the transformative powers of the new electronic technologies would be most visibly enacted. Drawing upon a two-year ethnographic investigation of a range of financial services organizations, the paper analyses fin de siecle enactments of the 'virtual' in terms of three closely interrelated problematics: virtuality as electronic mediation, virtuality as mimesis and virtuality as disposal. The paper uses the case of Mondex—a project to implement a smart card alternative to cash—as a vantage point from which to explore the performance of 'virtuality' in social organization.* ***Key words.*** *cashless trading; disposal; electronic mediation; mimesis; smart cards; 'virtuality'*

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Revolutions have the habit of eating their children and the so-called 'dotcom revolution' proved to be no exception. In this paper we explore the rise and fall (?) of one of those offspring: Mondex.com. Mondex is the name of a company originally set up by a consortium of British financial institutions to develop a smartcard-based alternative to cash. By the mid-1990s, the Mondex smart card constituted probably the best financed and certainly the most widely franchised of the many contemporaneous attempts to institute forms of 'electronic cash'. While arguably interesting in its own right, the Mondex experiment also offers a convenient vantage point from which to (re-)view the ways that this 'revolutionary' challenge to extant forms of organizing was enacted.

For some time commentary on business affairs whether by management academics, politicians, journalists or practitioners, has tended to employ revolutionary rhetoric. At the turn of the 20th century, management discourse came to be dominated by a chorus of sweeping claims concerning the inevitability of various technological transformations of business and organization, and urging adaptation to their social, economic and organizational consequences. A multitude of prefixes such as 'new', 'cyber', 'e' and 'virtual' were employed to distinguish the emerging novel economic, social and organizational forms from those deemed stuck in an obsolete past and thus condemned to the dustbin of history (e.g. Davidow and Malone, 1992; Jones, 1997; Kelly, 1999; Leadbeater, 2000; Martin, 1996; cf. Woolgar, 2002). Organizing, claimed the 'digerati',[1] would from now on be enacted in the 'realm of pure information' (Benedikt, 1992: 3)

> transforming the physical world, decontaminating the natural and urban landscapes, redeeming them saving them … from the diesel smoke of courier and post office trucks … from all the inefficiencies, pollutions … and corruptions attendant to the process of moving information attached to *things*—from paper to brains—across, over and under the vast bumpy surface of the earth rather than letting it fly free in the soft hail of electrons that is cyberspace. (Benedikt, 1992)

In the field of management studies, it was confidently proclaimed that, 'Organizations, as we have known them for hundreds of years, are disappearing. Literally … The next step virtual organization revolution … is sweeping the world' (Peters, 1997: 233).

The material[2] drawn upon here originates in a two-year research project investigating the role played by the new electronic technologies in bringing about a 'virtual marketplace' in UK retail financial services.[3] Observers had long identified financial services as constituting what we might call, a 'critical case'[4] for predictions concerning the likely consequences of the emerging technologies upon existing patterns of organizing and enterprise (e.g. Evans and Wurster, 1997). And indeed the financial services sector in the UK and elsewhere became, in the late 1990s, sites of intense experimentation with various forms of 'virtual' networking and delivery (e.g Guest and Madden, 1996).

Accounts of what 'virtual' might mean in this context, whether as defined in the mainstream management literatures or as articulated by our interlocutors are, of course, legion. Nevertheless, within the timeframe of the above project, we suggest that these accounts of the 'virtual' tended to be enacted as three closely interrelated cultural problematics that can be summarized as follows:

First is the conception of 'virtuality' as *electronic mediation*. Intimately bound up with the dominant understanding of information and communication technologies (ICTs) themselves, electronic mediation is most readily associated with those versions of the 'virtual' typically invoked by politicians, management gurus and the media. In the context of financial services, the theme is one of information technology as a key enabler in the facilitation and intensification of trading transactions and interactions through electronic networks. Electronic mediation endows 'cyberspace' with the status of an 'obligatory passage point' (Latour, 1987) for effectively organizing and conducting business.

Second is the conception of 'virtuality' as *mimesis*. The notion of virtuality as simulation, or rather that of presence in *effect,* though not in *fact*. The theme of imitation is most closely associated with dictionary definitions of 'virtuality'[5] as for instance, essence divorced from embodiment, the 'virtual' as opposed to the 'real'. It operates in organizational discourses as a potent metaphor for all that which does not really refer, but instead simulates reference. 'Virtual' reality thus refers to various immersive electronic simulations of concrete objects and environments. Pilots train in virtual cockpits and children play with virtual pets.[6] In this sense, the 'virtual' organization is a typical example of mimesis in that it conveys the *appearance/effect* of a single organization while in fact consisting of, for instance, a network of independent companies or casual workers, and other actors (contingently) combined to carry out a particular project. In sum, the virtual stands for the ability to generate the effects of a 'thing' without recourse to the 'thing' itself. This kind of usage is closely linked to the theme of electronic mediation as that which renders this new organizational *ars combinatoria* possible, or even thinkable.

Third is the conception of 'virtuality' as *disposal* used here in the double sense of elimination *and* ready availability. Indeed, the rhetoric of 'cyberspace', has long invested in a vision of technologically induced de-materialization or de-physicalization of social interaction. This is implicit in understandings of the 'virtual' in terms of the agency of what is absent—as already alluded to under the heading of mimesis. This redirects attention to what the various performances of the virtual are (re)defined in *opposition to*. In this sense, definitions of 'virtual' are simultaneously definitions of its other(s), of what virtuality will, or must displace. In other words, the theme of disposal represents a focus on what has to be *absent* in order for a particular entity, organizational arrangement and so on to be a credible candidate for the label 'virtual'. As we shall argue, in financial

services the practical problems of virtuality were commonly articulated via vocabularies that invoked disposal—such as the (in)ability to replace bricks and mortar (i.e. the branches and their standing armies of personnel) with 'virtual' networks. For all the companies investigated as part of this research, the disposal of expensive materiality (e.g. branches, staff, their 'old paradigm' infrastructure) and the appropriation of the self-service of the customer through Internet transactions, was a central feature of their enactments of virtuality.[7] 'Virtuality' can be seen in this respect both as a promotional discourse *and* as a set of practical problems.

We discuss in this paper how new information and communication technologies are said to make possible the *effective replication* (mimesis) and delivery of banking services to consumers *electronically* (mediation), that is *without the need for the infrastructure* of 'traditional banks' (disposal). Indeed, a range of organizations (and, in particular, major supermarkets) have a capacity to encroach on the business of banking and insurance and have done so, though largely so far in partnership with them. Electronic mediation has facilitated this in a number of ways. The infrastructure, originally put together in order to process the various material manifestations of money, was—ever since the latter's transformation into 'flows of information'—reviewed as a mode of entrapment from which, it was argued, 'traditional high street banks' need to obtain release if they are to avoid dinosaur-like extinction.

In what follows we use the framework outlined above in order to explore how these three problematics were enacted in the context of Mondex. We have already referred to the widely held view of financial services as the sector where the various visions of virtuality were to be realized. Against this backdrop, many observers came to view electronic cash as *the* 'killer application' among smart card uses (6 and Briscoe, 1997: 32; Howcroft and Hamilton, 1997). In this kind of discourse then, money—the financial object *par excellence*—came to function as itself a 'critical case' (see note 4): a prominent example *and* exemplar for all 'virtual' things to come.

Virtuality as Disposal

> The central event of the 20th century is the overthrow of matter … The powers of the mind are everywhere ascendant over the brute force of things … [This] overthrow of matter will reach beyond technology and impel the overthrow of matter in business organization. The exemplary technology of this era is the microchip … More than any other invention, this device epitomizes the overthrow of matter. (Gilder, 1989: 17)

Financial services, being an ideal-typical Negrepontian (1995) business of bits rather than of atoms, seemed in the 1990s to be—at least in principle—ripe for 'virtualization'. The sector appeared to many observers to represent a custom-made stage where the 'overthrow of matter in business organization' might be acted out. According to Leadbeater's (2000) highly influential[8] description of the 'New Economy', British banking was, at the

close of 1990s, caught in the remorseless grip of a technologically facilitated revolution:

> Vast branch networks used to be the only way to distribute banking services to customers. Until a decade ago these were a great asset … [and] a great obstacle to new competitors entering the banking business … because setting up a branch network … costs a lot of money. The branch networks were a commercial Maginot line. The new banks are bypassing the branch network and going direct to the customers using new technologies. The branch network has become a liability, a millstone around the banks' necks. Traditional high street banks are set up to deal with money as a flow of physical things—cheques, coins, notes, paying-in slips. The new banks deal with money as a flow of information. (Leadbeater, 2000: 22–23)

It is something of a commonplace that money is already the most virtual of entities, created, moved and expended at the mere press of a key (e.g. Kurtzman, 1993; Leadbeater, 2000). At the same time, the still enduring practical necessity of collecting, counting, storing and distributing *cash* presents challenges that have destabilizing effects on any 'virtualization' project conceived along those lines: 'Traditional high street banks', for instance, are impeded in their disposal of costly branch networks by the obduracy of physical cash as well as the ingrained habits of many customers.[9] Simultaneously, the new e-banks are not quite able to—as Leadbeater (2000) would have it—'live on thin air' but are dependent upon pre-Internet (Derridian) supplements (e.g. branches, ATMs) for the delivery of banking services to their customers.[10] Furthermore, and to the extent that cash has, as yet, no universally accepted electronic counterpart, micro payments[11] are difficult in business-to-consumer e-commerce. In short, cash signifies lack and excess. It indicates that the 'virtual marketplace' has not been performed adequately. Coins and notes are among those objects that appear irredeemably tied up to an 'old economy of objects and buildings' (Leadbeater, 2000: 23) and as a result more and more out of place in the emergent virtual marketplace. Cash increasingly appears as antithetical to the principles of mobility and speed said to characterize the Brave New 'Weightless World' (Coyle, 1999). Our interlocutors often conveyed this anomalous status of cash through the use of 'just so' stories. For instance:

> there was … a guy who used to run a news kiosk right in the centre of the shopping precinct in Swindon and he told me that he is within about 30 metres of about 50 ATMs and what people were doing in the morning was hitting the ATM, getting £50 out of the ATM and going to him for a *Daily Telegraph* with a £10 or a £20 note, so first thing in the morning he is going to the bank to get a massive ton of change and then later on in the day the school kids would kick out of school and go and buy their sweets and they'd be paying in coins so at the end of the day he was taking back a lorry load of change to the bank and each time he did that the bank charged.[12]

In her well known discussion of dirt and pollution, Mary Douglas (1966) has argued that objects are construed as being 'out of place', anomalous

or impure, to the degree that they appear to flout and disturb particular social categorizations. 'Pollution behaviour' is therefore a culture specific reaction to 'any object or idea likely to confuse or contradict cherished classifications' (Douglas, 1966: 36). Activities aimed at preventing pollution, and associated practices and rituals of disposal and purification, help in this way to maintain the integrity of social spaces that are supposed to be kept distinct from one another (Douglas, 1966). Disposal in this view, is a process of purification as part and parcel of the ordering work through which things, people and meanings are (re)arranged and put into their proper positions—without awkward remainders. Against this background, the Mondex 'electronic cash system' can be described as a socio-technical network of disposal designed to allow the 'virtual' to be successfully performed. Mondex, it is claimed, can be used '*in the same way*' as *ordinary cash* while at the same time having the advantage of rendering redundant the cumbersome apparatuses which the residual and polluting materiality of money imposes upon its handlers.

Mondex was conceived as a technological solution to the problem of replacing coins and notes *without* at the same time undermining the banks' traditional role in the circuit of money. Incorporated in 1994, Mondex UK started its career (1992) as a joint venture of two of what were then Britain's Big Four banks: the National Westminster and Midland (now HSBC). The Mondex system was then franchised in various countries including the USA (1997), Canada (1995) and Japan (1999). At the same time, public trials were carried out in ten different countries around the world with the UK pilot (1995) conducted in Swindon along what is known as the M4 corridor of economic hyperactivity. Swindon's population profile—in terms of age and class—is considered to be a 'microcosm' of the UK as a whole.[13] Mondex International—in which MasterCard acquired a 51% stake—was set up in 1996 to control the Mondex brand and manage the system's technological development (including security). In order to facilitate the adoption of its operating system (MAOS),[14] as a global standard, MAOSCo Ltd was established: a new independent not-for-profit company set up in 1997 to reassure potential users that MAOS was open and available to all those interested in using it.

Mondex operates on a smart card containing a microchip 'purse' onto which value, downloaded from the card holder's bank account, is held electronically. The card also stores the account holder's name, unique identification number, and a record of the last ten transactions. Value can—in principle—be transferred onto (or out of), the card via various channels including the telephone, the Internet, digital TV, mobiles or other Mondex cards.[15] Retail transactions between merchants and customers are carried out by swiping the card through a reader at the point of sale. Peer-to-peer value transfers between individual consumers are also possible by using a small card-reading device not unlike a calculator. In each case, value is debited to the payer's card balance and credited to the payee's:

bank authorization is not required. Mondex cards authenticate each other using secret cryptographic algorithms.

> Mondex really doesn't care about the security [of] the network that it's going down, which is unlike the credit card type transactions, because the security is inherent in the two chips and they could be two tin cans and a piece of wet string in between it, really the chip doesn't care as long as it can identify that [it] really is a Mondex chip at the other end and that the two chips, you know I have the amount of money that I need to make the transaction and I am sending it to a bonafide Mondex retailer.

It is claimed that a number of 'compelling benefits' accrue to those who use Mondex instead of conventional 'hard cash'. Among them, security and convenience are probably the most prominent. Merchants, such as shopkeepers, can avoid the costs and the risks (counting errors, holdups, shrinkage), which the presence and transportation of large amounts of cash entail. In business organizations' perennial struggle with uncertainty and noise (Tsoukas, 2005), the system would be, our interviewees' assured us, a potent technological weapon:

> The ability to cash up at the end of the day without having to count through endless piles of coins, you just press the total button on the machine and it says £422.37. You have not been giving out change so you've not got the change errors. The card in the point of sales device is locked so … shrinkage, if that's what they call it is eliminated in Mondex terms, you are not making mistakes and you don't have the sticky fingers in there. (1999 interview)

Consumers too can enjoy a higher level of security as Mondex cards can be locked[16] using a PIN number. Also users can have the convenience of access to their account from any location where there is a Mondex compatible device.

> … you don't have to stand in the rain, you don't have to be in a dark High Street and worried about who's standing behind you, you do it in your own living room … it was always a very easy thing to sell to retailers but that walk with the sack full of the day's takings to the night safe must have been the longest walk ever for some people and at the end of the day to bank the Mondex takings you do it over the phone and it's there. If you bank it at quarter to ten in the evening it's yours to use at quarter to ten in the evening.[17]

Even more straightforward are the benefits to the issuing banks. The disposal (or at least reduction) of the material and labour costs involved in the processing and storage of cash has already been mentioned. Realization of this benefit however, depends on the degree that Mondex does indeed come to be accepted by consumers as constituting—as the Mondex literature insists: 'a direct *electronic equivalent* of cash bringing convincing benefits to consumers and merchants transacting in the virtual world' (emphasis added).[18] The question of how equivalence and difference are socially established has of course figured prominently in the social study of technology. In his study of the 'social construction of fluorescent lighting' for instance, Wiebe Bijker (1992) has described the complex labours of design,

negotiation and persuasion that were undertaken by the relevant corporate actors keen to protect their commercial interests, with the objective of establishing whether neon tubes should be viewed as the same as, and thus a substitute for, incandescent lamps or not. This question of when, and for whom something might be deemed to be the *same as* or *different from*, something else is taken up below.

Virtuality as Mimesis

> Imagine it's *the same as* physical money and you won't be far off. (Timothy Jones CEO Mondex, cited in Holland and Cortese, 1995: 40, emphasis added)

The history of money has conventionally been written as a history of ever increasing abstraction.[19] For modern economics, the nature of money, which once was identified confidently with gold,[20] is that it has no nature but *functions*: any material object may be called money if it can function as a medium of exchange, means of payment, unit of account, standard of value and store and index of wealth. Objects—gold, cattle, tobacco, coffee beans—are adopted as money to the degree that they allow the operation of such functions.[21] It could, of course, be argued that, in order for any object to be able to perform these functions certain attributes are presupposed, like portability, countability, divisibility, uniformity, recognizability, substitutability (Crump, 1981). Leaving aside a certain circularity in economic definitions of money—money is what is accepted as money—what is important for this discussion is the suggestion that the operation of money rests upon *social consensus*. Economists describe this quality as confidence, while sociologists prefer to call it trust (e.g. Misztal, 1996). This in turn focuses attention upon a number of *how* questions. How does a society come to regard something as money in preference to something else? How do people come to be persuaded (and in the modern era, how are vending machines designed) to accept a particular object as money?

The possibility that multiple forms of money may operate in any given society, in various degrees of complementarity and competition, is, of course, a research topic familiar to economics as well as history, anthropology and sociology. In their study of the Tikopia in the Pacific, for instance, Firth and Yamey (1964) developed the notion of culturally defined spheres of exchange where objects can be exchanged only for other objects deemed to belong in the same sphere. They may not be exchanged for objects from other exchange spheres. Conversely, in her study of the use of money in modern occidental societies, Viviana Zelizer (1995, 1989) has noted how money, supposedly the most rationalized of objects, is not in fact a stable and fixed entity but is sometimes actively earmarked and differentiated by its users in to 'multiple monies' with meanings which are particular to them. She argues that 'not all dollars are equal' meaning that one 'kind' of money cannot, unproblematically, substitute for another (Zelizer, 1989: 343).

Thus, Helsinki prostitutes distinguish between social security payments ('clean money') to be husbanded carefully and earnings from prostitution ('dirty money') to be liberally spent on clothes and drugs. It is therefore easy to appreciate how the ability to see something (Mondex) as *the same as* something else—'physical money'— (Jones, 1996) is a complex culturally situated, social performance. Therefore, the success of electronic cash depends on its issuers' ability to persuade a potentially skeptical public that Mondex effectively replicated all the desirable properties of cash.

> we are looking at dropping off some of the things that money, cash, doesn't do particularly well, you know, things like the heavy weight of it and wrestling for the right amount of change when you get on the bus … having a £10 note is not a good idea because the bus driver is either going to turn you off because he doesn't have enough change or give you a wheelbarrow full of change because he is feeling bolshy that morning. So the ability to dispense totally with the idea of change, you know, it's right money every time, he's on the shift, it's ready to be paid. … you are keeping the things it does do well and in typical evolutionary terms you are adding on a couple of things that couldn't happen before.[22]

If '*Mondex is Cash is Mondex is Cash is Mondex is Cash*' as the masthead of *Mondex News*—and the billboards in Swindon—insistently proclaimed, then Mondex *must* establish its differential character from all the other (debit and credit) cards that fill consumers' wallets and with which it might be associated and/or confused. Like cash (and unlike other payment instruments), it facilitates peer-to-peer value transfers, but it is also different because of its overall effects upon consumer behaviour. For instance, Mondex was said to enhance financial self-discipline (Knights and Vurdubakis, 1993) since—again like cash, and unlike credit cards— 'with Mondex the card holder can only spend what is on the card, so there is no risk of going into debt'[23] a feature particularly useful in efforts to regulate the financial affairs of the young.

> … the safest card to give [to kids] is Mondex because they cannot overspend with it, they can't run up £13,000 worth of debt [on the Internet] with the one card. (David, Mondex, 1999)

The trope of mimicry is similarly employed even when explaining (away) what might at first sight appear as the disadvantages or limitations of the Mondex electronic cash system. For instance, if a Mondex card is lost, whatever value is stored on it is also lost. Could perhaps this value be reclaimed from the issuing banks? To do so, our interlocutors argued, would violate the logic of equivalence of Mondex and cash; people should claim from their household contents insurer instead, as they would for cash:

> there is no obligation if you lose a £10 note to turn up at the bank of England down the road and say excuse me I lost one of your £10 notes can I have another one please. Or, are you going to give a reward for the return of my £10 note.

Any brief summary of the 'desirable properties' of cash would include the following: security, durability, portability, divisibility, recognizability, transferability, anonymity and untraceability. The replication of some of these attributes turns out to be more problematic than others. Mondex security, for instance, soon became the object of intense controversy. Strong claims were made—in both the company literature and by our interlocutors—regarding the high level of security of the Mondex system.[24] 'Robert', manager in one of Mondex UK founder banks, put the issue as follows in a 1998 interview:

> Mondex itself has got an enormously high levels of security and some of the biggest labs in the world have tried to crack into it, and nobody has done it so far. There are various sorts of scare alarms that get passed around all the time but … our challenge is on the table … the more people who try to hack into it the better ….

One of the most widely publicized 'scare alarms', to which Robert alludes, had been started two years earlier by a team of Cambridge academics who cast doubt on the security of all tamper-resistant cards. '[T]rusting tamper resistance', they concluded, is problematic as 'smartcards are broken routinely'. Systems such as Mondex, they argued, are probably not viable given that they embody all the necessary pre-conditions—such as high financial incentive and unhindered access to multiple instances of the device— 'for their encryption key material to be retrieved' (e.g. Atkinson, 1997; Brown, 1997a, 1997b, 1997c; Stalder, 2002). *Pace* Robert's claims in the interview extract above, the researchers had not actually 'tried to crack into' the device. Doing so would have rendered them liable to prosecution by Mondex under the UK Computer Misuse Act 1990.[25] The only people, who may, as it were, legally 'hack into' Mondex, are the Mondex engineers themselves. Everybody else has to take their word for it.

Even more controversial proved Mondex's claimed ability to reproduce the anonymity and untraceability of cash transactions (Stalder, 2002). Ever since its introduction, Mondex has been under a cloud of suspicion on account of its privacy implications. Widespread use of electronic cash invokes the specter of massively extended surveillance and panoptic monitoring. It stokes fears of personal transaction data being offered for sale to 'forensic marketers' (Bloomfield and Vurdubakis, 2001; Leyshon and Thrift 1999). Mondex therefore immediately became the object of a sustained attack by privacy campaigners around the world who disputed its claim to anonymity (e.g. Davies, 1996; Lilley, 1996; Privacy International, 1996). For them, Mondex was *not* like cash (McKay, 1997); and the company's protestations to the contrary were viewed as suspicious.[26] Mondex itself did not always help the situation.[27] Perhaps in line with the desire voiced to retain those characteristics of cash deemed desirable while disposing of those deemed less so, its spokespersons appeared to provide contradictory assurances on the subjects of privacy and money laundering (e.g. Davies, 1996; McKay, 1997). On the other hand, it has recently been claimed

that the general public is not as concerned with surveillance as privacy advocates seem to believe (e.g. Mason et al., 2002; *The Economist*, 1999, 2002). In this account, consumer privacy concerns would not be a major stumbling block for Mondex—if there are compensating benefits. While the benefits to banks and merchants might have been obvious enough, those to consumers were (and remain) much less self-evident. This raises a number of issues concerning the status of Mondex *qua* cash, which we take up below.

Virtuality as Electronic Mediation

> the Mondex card [is] designed to overcome the one drawback of telephone banking. The phone cannot deliver cash. Just as a telephone card holds credits so the Mondex card holds cash. (Rowe, 1998: 57)

Underpinning the preoccupation with mimesis and disposal is what Green and Harvey (1999) have termed 'the connection imperative': the frequently repeated political and commercial mantra that everyone must connect to ICTs and must do so immediately. In the discourse of the 'Internet revolution', connection was promoted as a virtue in itself. Organizational (or for that matter individual or national) success or failure appeared to ultimately depend upon the ability to forge effective ICT connections to a network of networks (Castells, 1996, 2000). Against this backdrop, banknotes and coins— 'hard cash'—increasingly stuck out as a symbol of un-connectivity. The so-called 'cash economy' is after all inhabited by the poor and the dispossessed—including many without credit cards or even bank accounts. Those in other words, who are excluded from the 'virtual marketplace' (Noble et al., 1999). The notion of physical cash as anomalous, (or even prohibited), in the virtual marketplace of the future takes has been dramatized in William Gibson's fictions such as *Neuromancer* (1984:6) —the novel through which the notion of a 'Cyberspace' has entered information age folklore. In one of our interviews (1999), 'David', described this incongruous status of cash as follows:

> … you can [even] change your will at midnight on Christmas Eve if you want to. So virtually everything you want to do or could need to do, you can do [on-line or] on a telephone, but if you want cash, you've got to go out and stand in the rain alongside everybody else and [use] a teller machine or go in through the door and talk to a cashier … [It is] the final missing link in the financial chain, cash. You can get all the other stuff, electronic loans and electronic cheques through credit and debit cards, no problem, but the folding notes that you put in your wallet, you couldn't find any other way of doing that at all.

Cash then, is what disrupts the network. It is a gap, a missing link, in an otherwise potentially seamlessly interconnected 'virtual' world of instant access. Gaps signify the incompleteness of disposal. They represent fractures through which what has been excluded by what we have referred to

here as the 'virtual project', might leak back in (Strathern, 1999). The fate of the world's first purely Internet based bank—the short-lived Security First Network Bank (SFNB) —might be instructive in this respect. It was quickly taken over by the Royal Bank of Canada (RBC), a progressive but nevertheless conventional 'bricks and mortar' institution: The 'future of banking' was devoured by the past.[28] The virtual and its Other do, it seems, inhabit and inhibit one another. From the point of view of the virtual project, cash poses an acute problem of dislocation or displacement.

Mondex stood for the possibility of rendering real a 'virtual marketplace' of multiple connections: telephone connections but also Internet, mobiles, digital television and so on. Electronic cash is the vision of virtual exchange without a material remainder. It writes the next chapter in a teleological history of the money form (Harris-Solomon, 1997; Holland and Cortese, 1995). The cashless society long prophesied but constantly deferred, had now, in Mondex found the instrument of its realization.[29] From now on there would be 'no need to fumble for change or search for a pen, no need to wait for authorization, no need even to go to a bank or ATM', or so Mondex publicity claimed. In the words of one of our Mondex interviewees (1999):

> I think I see it as really continuing the evolutionary process that cash has been going through ever since it was part of a herd of cows and then a bag of salt and so on. People don't actually realise, they think because cash has been around in the form it is in now, for their lifetime, they assume that that's how it always was and I guess that, you know the Roman Centurions would probably have said, leave me alone, I know where I am with my bag of salt, just as people are now saying, leave me alone I know where I am with my £10 notes and my heavy change.

However, the 'next chapter' in the history of money could be written in a number of radically different versions; and banks do not play the lead role in all of them. For many techno-enthusiasts, banks are parasitical organizations, creatures of a technologically primitive past, which the emerging e-society will inevitably render disposable. In the oft-quoted dictum of Bill Gates at Microsoft, the world may need *banking*, but it does not need *banks* (e.g. Mackintosh; 2000; Sreenivasan, 2000). The founder banks therefore had devised Mondex in an environment rife with speculation about their own impending demise. The Mondex system and its artifacts were—as we have seen—designed to enact a *particular* version of the cashless society, one where the banks retained their pivotal position in the circuit of money.

Latour (1987, 1996) has suggested that the success or failure of such socio-technical innovations should be accounted for in terms of the struggles between competing 'actor-networks'. Mondex can thus be viewed as engaged in a struggle not only with the 'actor-network' of physical cash, but also with alternative electronic cash systems such as Digicash or Visacash[30]—to mention but two of the best known—which attempted to

translate the vision of a cashless society in terms of different technological configurations and organizational arrangements. As we have seen, in these struggles Mondex itself could deploy some powerful technological and commercial actors (Stalder, 2002). At the same time, and as the earlier comment concerning the modern-day Romans and their bags of salt indicates, it was clear that the Mondex network would stand or fall on whether it could persuade the users of cash to adopt, and eventually defect, to it. That is to say, Mondex would 'work' as cash if, and only if, enough merchants *and* consumers joined the Mondex network. Whether controversies over security and privacy have had any effect upon consumer attitudes is difficult to say. What seems more certain is that a desire to be a techno-pioneer, to partake of 'the future of money' (Holland and Cortese, 1995) was not in itself sufficiently appealing or compelling to induce consumers to enroll or pay the fee …. Neither was there sufficient attraction in *not* having 'to carry around a big wallet or a big purse which has got cash, paper, coins, it has got credit cards, debit cards, probably some loyalty cards … a big fat wallet' (IT manager in a 1998 interview). Perhaps, as Zelizer (1995, 1989) might argue, consumers simply failed to recognize their cultural experience of cash in such descriptions. Whatever the sources of resistance, without the benefits of wide participation, and in spite of the ever increasing technical and commercial sophistication of the product, the trials conducted in various communities around the world tended to fizzle out one after another. The problematic element in the network was the human actor. '[T]he fantasy [of electronic cash] was not science fiction; the trouble was the people. Electronic money is here, but hardly anybody is eager to use it' noted *The Economist* (1998) regretfully. 'Why has all this thrilling technology left consumers so unimpressed?' Mondex, it seems, had fallen victim to a Baudrillardian (1983) indifference of the masses.

Despite the considerable resources and ingenuity of Mondex's commercial backers, and despite the sophistication of the technology itself, hard cash—for all the predictions of the digerati[31]—has, as yet, failed to melt into (thin) air. Of course, this is not the end of the dream of a 'virtual marketplace' of electronic connections, of electronic cash or even of the Mondex project itself. If, as *The Economist* (1998) put it, electronic cash 'turned out to be a solution in search of a problem' (that insufficient numbers of potential users recognized themselves as having), then the present hiatus could conceivably be construed as akin to a regrouping while appropriate 'problems' are identified—or rather, constructed. Indeed, in the years since the retreat of Mondex, electronic 'cash' has hardly been absent from the news. At one end of the spectrum we see applications such as the Oyster system which thousands of commuters use daily on London Transport. Oyster is not perceived as, nor does it claim to be, electronic cash, but rather a solution to a specific practical problem.[32] In more technophilic societies such as Japan and Korea the 'virtual wallet' has become 'm-cash', a facility available on mobile phones[33] eliminating the need for a dedicated application

(e.g. Kageyama, 2004).[34] At the other end of this spectrum, there is the facility apparently on offer to revellers in a Glasgow nightclub willing 'to have a microchip implanted in their arm to save them carrying cash' (Cramb, 2005),[35] a case of history repeating itself as a stunt.

Conclusion

> money is involved in the general development which in every domain of life and in every sense strives to resolve substance into free floating processes. (Simmel, 1978: 168)

For Simmel (1978) money is a synecdoche for modern social relations. The *Philosophy of Money* thus elaborates a view of money as the medium for, as well as a reflection of, many of the transformations we commonly identify as characteristic of occidental modernity. It is worth noting, however, that Simmel's argument is not teleological. So the drive towards abstraction he describes so well might equally be seen as a process of continual deferral. Indeed, for Simmel, economic practicalities and the exigencies of social practice conspire in such a way that money 'cannot cast off' (Simmel, 1978: 158) its material residue.

It is perhaps a testimony to the enduring influence of technological determinism that many popular and academic commentators on the role of money in the 'network age' appeal to the kind of unproblematic teleology that Simmel eschewed. For them if money is subject to a process of de-materialization, the time cannot but come when there will no material remainder. Indeed for some commentators, such as Kurtzman (1993), the 'death of money' as a material object has already happened:

> [Money] has become nothing more than an assemblage of ones and zeros … piped through miles of wire, pumped over fiber-optic highways, bounced off satellites, and beamed from one relay station to another. … [It] can be seen but not touched. It has no tactile dimension, no height or weight … Money is now an image. (Kurtzman, 1993: 15–6)

It is therefore not difficult to appreciate how Mondex and other equivalent devices came to be construed as but the last chapter in a chronicle of a death foretold: the ultimate disposal of 'hard' cash. 'Electronic cash' thus entered stories of 'virtuality' as an example and exemplar of a 'new economy' and a 'virtual society' in which matter no longer really mattered and distance was dead (Benedikt, 1992; Cairncross, 1997). It is then perhaps not altogether too fanciful to consider Mondex (as we have done here), as synecdochal for a whole range of attempts to enact (and effect) the emerging 'virtual' or 'e' society and economy. Mondex's virtues and limitations could thus be seen as the virtues and limitations of the 'virtual project' itself, and Mondex's ultimate fate as instructive for all attempts to make sense of that *specific* enactment of the 'virtual'.

Our examination of Mondex as a particular, 'failed' financial technology also draws upon a wider, well-established research tradition of viewing artifacts—including technological ones—as simultaneously, functional objects *and* ways of performing social organization (e.g. Mauss, 1954; Munn, 1986; Pfaffenberger, 1995; Simmel, 1978; Taussig, 1993). Notably, recent work in the social study of technology has focused on and explored the *performative* dimensions and consequences of accounts of technological innovation and diffusion (e.g. Bijker and Law, 1992; Bloomfield and Vurdubakis, 2001; Cooper and Woolgar, 1994; Grint and Woolgar, 1999; Law, 2000; Mol, 2002; Woolgar, 2002). 'Technology stories' according to this tradition are ways of performing technological realities (Law and Singleton, 2000). In line with this work, our examination of Mondex focused on the attempt to realize the concept of electronic cash through the enactment of three interrelated visions of the 'virtual': as electronic mediation, mimesis and disposal. A specific focus has been the problematization (Callon, 1986) of cash as mere 'grubby banknotes' and 'jangling coins' (*The Economist*, 1998), a material remainder the elimination of which would be but a matter of time and technological fine-tuning. And yet such awkward remainders often tend to persist and thus confound the expectations. The paper-less office, another technologically facilitated revolution originally proclaimed in the mid-1970s and ever since continually postponed, is perhaps the paradigmatic case (Brown and Duguid, 2000: 18–19; Sellen and Harper, 2001).

It is therefore hardly surprising that Mondex, like many other technologies of the self-proclaimed 'virtual' (or e-) economy and society, including the internet as a distribution mechanism (e.g. Knights et al., 2002), has had its history re-written as a narrative of e-volution rather than revolution. Abandoned is the vision of disposal via *mimesis*, the 1990s' notion of replacing physical cash. Mondex now merely claims to *supplement* rather than replace physical cash. 'Mondex is an alternative to cash not a replacement' argues the new website.[36] 'The unique Mondex platform allows its use in multiple channels where cash cannot be used'. By the closing stages of the research reported here, it was becoming increasingly apparent that Mondex was being absorbed by precisely those other 'bits of plastic' from which our interlocutors a few years earlier were at pains to differentiate and distance it. New applications have incorporated the Mondex technologies as add-ons or extensions to services already being provided by existing payment instruments—such as debit and credit cards.[37] At the time of writing in 2005 Mondex has become a feature of MasterCard's OneSMART™ program. There remains the open possibility that the familiar vehicles of debit and credit cards will overcome the resistance of human actors in a way that Mondex, as a novel technology, failed to accomplish. For the time being, however, the Mondex case teaches that rumours of the imminent demise of money as a material object should be treated with some caution.

Notes

1 'Digerati' is a neologism coined (from the *digital* and *literati*) by either George Gilder or Tim Race (of the *New York Times*) to provide a suitable (self-)description for the intellectual elite of the digital era. The term thus alludes to the overtaking of a literary culture by a digital one. See for instance 'Who are the Digerati?' at http://www.edge.org/digerati/ and also http://en.wikipedia.org/wiki/Digerati. The term is indeed evocative of, what we might call, the zeitgeist of the era discussed here and that is why we are using it.

2 This research was entitled 'The Virtual Market Place? Implications from the Financial Services Sector', and was carried out under the auspices of ESRC's *Virtual Society? The Social Science of Electronic Technologies* programme, from 1998–2000 ESRC (Grant No. L132 25 1046). The main focus of the research was the activities involved in the establishment and maintenance of 'virtual' distribution channels in personal financial services. The researchers carried out four case-studies of major corporate actors in the UK financial services sector (including the Mondex founders) in order to: (i) identify the (claimed) 'transformative role' of particular electronic technologies in relation to organizational activities and the shaping influence of particular organizational social/contexts in the adoption and transformation of these same technologies; (ii) investigate the social, organizational, regulatory and business 'consequences' of these processes. The principal methodology was qualitative based on case study research, supplemented by a range of additional interviews conducted in non-case study organizations, and the examination of published sources in order to better contextualize the findings.

3 Financial services are a critical case in the sense that because their products are already abstract and intangible, you would expect these to be an ideal site for remote or virtual electronic distribution. This is in a parallel way to how Goldthorpe et al. (1968–70) saw the strike prone automobile industry as a critical case for examining social class.

4 As for instance, 'almost, even if not exactly or in every way' (Cambridge Dictionary) or 'what does not physically exist, but is made to appear by software' (Wikipedia).

5 For instance subscribers to Virgin's 'virtual girlfriend' service, receive loving text messages from an 'electronic admirer' (*Metro*, March 12, 2002).

6 As Guest and Madden's (1996) influential report on the subject argued, '[A]ll the evidence points to virtualisation. By definition virtualisation will break through constraints of space and time. As a result, a financial services company's customers will "see" less of it, but, ironically, spend more time with it …. Obviously, customers of new branchless financial services companies will have no option, the virtual channels will be the organisation' (p. 81).

7 A tract that according to UK Prime Minister Tony Blair's endorsement, 'raises critical questions for Britain's future' (from the front cover).

8 One might add the limited appeal of Internet banking. Only by discounting their products to a point possibly below levels of normal profitability were the e-banks able to attract customers en masse even at the peak of dotcom euphoria. For example, e-banks such as Egg, If, and Smile established respectively by the Prudential, Halifax and Co-operative banks sought to attract customers through high interest rates on deposits or low ones on loans. Egg came close to collapse at one point as a result of rate chasers switching their accounts as a result of the latest high interest deposits or low interest loans.

9 It is perhaps not altogether coincidental that the (then) Big Four UK banks had during this time often appeared anxious to impose disproportionate charges to non-customers for the use of their ATM cash machines in spite of the inevitable opprobrium (Knights et al., 2000).
10 That is payments of very small amounts where it is uneconomic to use a credit card. In other words, consumer goods in cyberspace, are forced to be either expensive or free.
11 Mondex executive in a 1999 interview.
12 Swindon's retail profile was also an important factor for its choice as the UK pilot site: 'Swindon was chosen … because it … [is] the UK in microcosm. Its got all the big names, all the nation wide names around and it's got the same kind of mix as the UK of big medium and small so it's the UK High Street basically personified' (Mondex executive interviewed in 1999). For other pilot sites see www.mondex.com/html/mapoftheworld/
13 Multi Application Operating System.
14 The operation of the Mondex system requires four types of card: (i) the originator card which is used to create and eliminate value *ex niliho* onto/from which value can only be downloaded from/to; (ii) the bank card which is able to hold large amounts of value and to interact with all three types of card; (iii) the merchant card and (iv) the consumer card (see for instance *Mondex News* 1)
15 In practice, however, locking and unlocking the card can be inconvenient so few users do. For instance: 'What we discovered after, we installed card and locking devices all over Swindon so in the big stores there is one in the entrance to every department, they are all over the place. We actually monitored their use because every time someone goes to lock the card it sends a … it keeps a little log, not of any of the details of the numbers or anything, just someone's used me once, twice, three times today and we are now finding that people are not locking their cards … people discover that they just take care of it like they would their physical cash, you don't padlock your wallet you put it away, so people just stopped doing it and now the instances are really, really low, people just don't lock cards' (David commenting on the Swindon trial in a 1999 interview).
16 With cash on the other hand, 'I think some retailers have been somewhat embarrassed occasionally by banking their takings into the night safe and going at 8 o'clock the next morning to the cash and carry and finding that their cheque which has run through the quick clearance system, the money hasn't hit their bank account yet, it is still on the floor in the night safe and it is waiting to be pulled out and counted and paid in'.
17 www.mondex.com/webcode/common/contents.asp?ID=45
18 For a nuanced historical sketch of the complex relationship between money, materiality and notation see Ezzamel (1997) and Ezzamel and Hoskin (2002).
19 'Gold is a most excellent thing. Of gold is treasure made: the man who possessed gold does all he desires in the world and can even sent souls to paradise' Colombus writing to Ferdinand and Isabella of Spain in 1503, (cited in Clissold, 1961: 19).
20 In ancient Sparta on the other hand, the adoption of cumbersome heavy iron coins, was intended to *impede* the circulation of money and the accumulation of wealth as incompatible with the martial ethos of the polis.
21 Mondex executive at a 1999 interview.
22 www.mondex.com/webcode/common/contents.asp?ID=42

23 In September 1999, for instance, Mondex became the only smart card application to be awarded Level E6, the highest possible ITSEC (Information Technology Security Evaluation Criteria) rating.
24 Another similar controversy surrounded a reputedly successful attack on the 3101 chip (used by Mondex for the Swindon pilot) in Australia.
25 For example Simon Davies, director of Privacy International, complained to the Trading Standards authorities in Britain (Bromley) that Mondex was not anonymous as portrayed in the company's promotional literature (see http://www.privacy.org/pi/activities/mondex/complaint.html). As the result of this complaint the word 'anonymous' was changed to 'private' at the Mondex website. (For the Trading Standards decision see http://www.privacy.org/pi/activities/mondex/mondex_response.html).
26 See for instance the Canadian Imperial Bank of Commerce (leaked) memo on the degree of privacy offered by Mondex available at http://www.efc.ca/pages/mondex/cibc-memo. 30jan97.html
27 For a brief history of SFNB see www.sfnb.com
28 Ironically, though, one of the benefits for the issuing banks is that it 'frees up' for other uses or puts at their disposal a (potentially) significant share of the cash normally used in day-to-day transactions that is now processed through Mondex. The irony is that to name this as a benefit to the banks is to assert the limits of mimesis. That is to say, the equivalence between Mondex and cash (to be) established at the level of the consumer, is in turn dis-established at the level of the banks. The difference between virtual money (Mondex) and real money (hard cash) is thus not abolished but put into a state of deferral.
29 Visacash was being piloted in Leeds at the time.
30 E.g. Craig (1998).
31 See http://www.tfl.gov.uk/tfl/fares-tickets/2006/oyster/general.asp#what
32 There are at present two main e-money platforms SUICA and EDY competing in Japan, both based on SONY wireless multi-application smart card technology.
33 For instance, Fujitsu's 3D x 3D mobiles can be charged with up to Y50,000 and are protected by a fingerprint reader.
34 The 'digital wallet', the size of a grain of rice, guarantees entry to the club and allows customers to buy drinks on account' (Cramb, 2005). The concept originated at the Baja Beach Clup in Barcelona, Spain using the VeryPay system.
35 https://hsm2stl101.mastercard.net/public/login/ebusiness/smart_cards/resources/FAQs.jsp.

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