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Virtual currency as an inclusive monetary innovation for the unbanked poor

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ABSTRACT

The narrative about the future of money in developing countries is dominated by *international financial institutions* (IFIs) and their affiliates, multinational payment service providers, mobile network operators and academia. Most have reduced the future of money or monetary needs of the unbanked to the eradication of cash by digitization. In contrast to this techno-centric narrative, in this article, I situate the future of money in a new sociotechnical model which I refer to as the *quantity, quality and public authority deficit* (QPAD) hypothesis. It recognizes three disadvantages (or deficits) from the use of money: *quantitative limits*, which relates to the fact that its capacity to act as medium of exchange, is conditional on its availability; a *qualitative deficit*, involving the failure to embody attributes of transacting parties (identity, reputation etc.); and a *public authority deficit*, represented by weak central authority involvement in addressing the monetary needs of the unbanked poor. On this basis, any future inclusive monetary innovations which do not address these three deficits will most likely be unsuccessful. These ideas are based on findings from a participatory ethnographic study that draws on a *sociology of scientific knowledge framework* (Mackenzie, 1996; Pinch and Bijker, 1984; Spinardi, 2008) to evaluate technological properties of the Edinburgh *local exchange trading scheme* (LETS)-issued virtual currency. This currency is compared and contrasted with the properties of government-issued money.

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1. Introduction

This study redefines the problems towards which future monetary innovations for the unbanked poor should be geared, by contributing answers to a simple but complex question: What are the monetary needs of the unbanked poor in developing countries and what is the role of *information and computer technology* (ICT) in addressing them?

These are relevant questions because a deep understanding of user needs and the definition of the key problem are necessary in the critical first stage of most innovation models (Abernathy and Utterback, 1978; Rogers, 1983; Urban and von Hippel, 1989). *International financial institutions* have reduced the monetary needs of the unbanked poor to their supposed need for bank-sourced money, while mobile network operators, international payment providers, and academic researchers speculatively situate them with respect to digital money or mobile money.

In contrast to these top-down, supply-driven approaches, I situate the future of money for the unbanked poor in a new sociotechnical model, which I refer to as the *quantity, quality and*

public authority deficit (QPAD) hypothesis. It recognizes three disadvantages or deficits from the use of money (M0).¹ They include: *quantitative limits*, which relates to the fact that money's capacity to act as a *medium of exchange* is conditional on its availability; a *qualitative deficit*, or money's failure to embody the attributes of the transacting parties, including identity and reputation; and a *public authority deficit*, which is created by weak central authority involvement in addressing the monetary needs of the unbanked-poor. On this basis, I argue that any future inclusive monetary innovations which do not address these deficits will likely be unsuccessful.

This study broadly fits into post-2015 development informatics research priorities based on the work of Heeks (2014), who identified gaps at the convergence of *ICT and developmental finance* (ICTDF). More specifically, my study responds to criticisms by Duncombe and Boateng (2009) that research projects at the intersection of ICTDF lack contributions by researchers from developing countries, and that they are commercially-driven and thus lack sufficiently deep community needs assessment.

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¹ The unbanked poor have been confined to use of fiat currency, notes and coins, which circulates outside banking institutions.

First, I am offering this article as a designer of web and mobile payment systems for international remittances, with an academic background in Finance, Financial Information Systems and Science and Technology Studies but currently working as a researcher for an Africa-based academic institution.

Second, I also respond to the criticism about the predominance of commercially-driven ICTDF research projects. As a result, this research article is based on a case study of a grassroots initiative related to a non-government-driven virtual currency, issued by an Edinburgh-based *Local Exchange Trading Scheme* (LETS).

Third, a strong community needs assessment is developed via the inductive part of the *sociology of scientific knowledge analytical framework* (SSK) (Mackenzie, 1996; Pinch and Bijker, 1984; Spinardi, 2008).² I draw on it to evaluate the technological properties of a virtual currency, and compare and contrast them with the properties of government-issued money (MO).³ My goal is to draw lessons upon which future monetary innovations in developing countries could be based. This is the origin of the QPAD hypothesis. I have also set a research agenda which spotlights the materiality of government-issued money, especially cash and coins as a credible unit of analysis. This often-overlooked and mundane technological artefact is the dominant form of government-issued money that is accessible to the unbanked poor. Thus, its examination cannot be separated from the monetary practices and needs of the unbanked poor.

One possible concern about this research is about how an Edinburgh-based case study can contribute towards the design and development of inclusive monetary innovations in developing countries? The arguments against simplistic ideas – that western innovations and technologies can be effortlessly transferred to developing countries – are credible. However, at the outset, I am not on a grand mission to find a generally applicable blueprint designs. Instead, there are perils with expecting that knowledge and technologies from the west can be flawlessly transferred to developing countries (Korten, 1980). Any contributions that I may be able to make on future monetary innovations for the unbanked will be partial and incomplete. A new paradigm-shifting, free-standing inclusive monetary technology may emerge from this, but only with small incremental shifts.

The origins of popular technologies, such as computers, email messaging, text editing software packages and most mobile phones were in Europe, yet many of them now are fully integrated in many developing countries. My case study shares some of the contextual realities faced by the unbanked poor there. For example, currency schemes like LETS operate on meagre financial resources, and have little access to sophisticated technologies or technological know-how. Most participants in these schemes are socially excluded, and they experience severe poverty and deprivation. These are realities facing the unbanked poor in developing countries today. Their payment system shares similarities with developing countries non-monetary exchanges, which are more relational and culturally rich, including reciprocal exchanges, and the so-called primitive currencies (Abdul-Rahman and Hailes, 1997; Misztal, 2013; Adler, 2001; Ben-porath, 1980). Further, the virtual currency used by LETS is reliant on social capital, which for centuries has been the cornerstone of the oldest forms of currencies in developing countries (Szreter, 2002; Valeri, 2011).

My findings are targeted at developers and promoters of bottom-up user driven innovations. These can be explained by the recent financial disintermediation of the market for debtors and creditors by non-experts. This has attracted new participants who are introducing collaborative approaches centered on humanistic concerns more than profit (Belk, 2014; Flannery, 2007). Examples include peer-to-peer lending models, where donors in developed countries lend as little as US\$25 to borrowers in developing countries with no interest charges. Leading players in this sector include Kiva, Prosper, Zopa, GlobalGiving, and many others (Kauffman and Riggins, 2012).

These innovations do not develop in a linear way. Their emergence is subject to luck, serendipity, accidents, success and partial success, failure, and other factors (Akrich, 1992; Christensen, 2013). Thus, the complexity around the development of new technologies requires experimentation and the flexibility to accept uncertainty. Furthermore, the rationality for choosing an analytical framework which privileges materiality of a technology is that where these properties are transferred to a different context, its more complex constituents such as social, organizational and political components will only be reinstated by the new contextually environment. For example, countries that adopted the U.S. dollar as their national currency due to the instability of their own currencies would have found it impossible to do so if the precondition was to wholly adopt the U.S.'s monetary policy in its existing form. Some may find it difficult to picture any parallels with my own study because it is based on a virtual currency, while a U.S. dollar bill is tangible and can be shipped to another country.

2. Methodology

This study examines the technological properties of a *non-government issued virtual currency* issued by a Local Exchange Trading scheme (LETS). To participate in it, I paid a £5 membership fee in December 2012. A few weeks after that in January 2013, I was elected to be a technology lead committee member and continued to participate in the scheme for close to 18 months. I took part in committee and annual general meetings which became a valuable source of primary data. Additional sources of primary data included participant observation during trading fairs held every 1 or 2 months, and through online ethnography, through which I virtually observed member interactions and trading activities on the Edinburgh LETS online portal at least once per week. Secondary sources of data included committee and annual general meeting minutes document analysis.

I next provide the rationale for evaluating the materiality of an intangible virtual currency and tangible (cash) technological artefacts, over social constructivist approaches for studying technology and money. This is followed by a brief history of LETS to provide background on the domain in which my study is based. My research findings are divided into several subsections which provide an account of how the QPAD hypothesis and the neocommodity economic theory of money emerged, before I conclude.

3. The materiality of technological artefacts

By choosing the SSK framework, the materiality of technological artefacts is applied, instead of the more common social constructivist approaches centered on technology as socially-constructed and shaped. This choice may attract criticism from social scientists from technology studies and anthropologists from economic anthropology that I may be over-estimating the instrumental and the functional attributes of government-issued money and virtual currencies. Studies which narrow the focus on the physical properties of an artefact tend to be dismissed as *technological determinism*

² According to Mackenzie (1996), knowledge about a technological artefact is acquired through three processes: *via authoritative claims* made by experts; *by induction* through testing and using the artefact), and *by deduction* with extrapolation from expert claims, models or theories)

³ I largely relied on the inductive part of the SSK framework to make comparisons. I also drew on the deductive part, via government monetary authorities' expertise that money is a medium of exchange, unit of account, and a means to store value.

(Markus and Robey, 1988). Organizational studies scholars (Leonardi et al., 2012; Orlikowski, 1992) and others from Science and Technology studies (Hutchby, 2001; Kling, 1992) argue that materiality matters in the analysis of technology. Similarly, I argue that this applies to mundane artefacts such as notes and coins, and virtual and digital currencies.

DeSanctis and Poole (1994) attributed the tendency to undermine socio-material attributes of mundane objects (notes and coins, claw hammer, or binary 0–1 objects in software) on the perception that they are stable and unproblematic (Orlikowski, 2007), or functional simplification and closure. The latter refers to the fact that the core features of such mundane objects are stable and less negotiable: they go beyond the reach of ordinary users. There is little tinkering that a carpenter can do with the head of his claw hammer, or a typist can do with the software code of a text editing application which keeps crashing.

My conceptualization of money (M0) (parentheses added to distinguish it from economists' M0 and M1 abbreviations for different metrics for money supply) is aligned with the realist perspective: money accords with everyday language or as understood by financially-excluded individuals, who are relegated to the use of notes and coins only. Guyer (2012), for example, refers to it as *people's money*. On the other hand, economists commonly classify the stock of government-issued notes and coins held by members of the public and on-demand deposits held by the banks as *narrow money* or *outside money* (Janssen, 1998; Thorp and Turnbull, 2000). Such currency circulates largely outside commercial banks.⁴

Since LETS is likely to be unfamiliar territory to most in ICT, I next provide a brief history of its origins, followed by an account of how I applied the SSK framework to inductively reveal the properties of an intangible virtual currency, which I compared and contrasted with those of government-issued money.

4. A brief history of the local exchange trading scheme (LETS)

4.1. Background

Originally, the acronym “LETS” stood for “local employment trading system.” However, now the acronym is commonly used to refer to a *local exchange trading scheme* (Hart et al., 2010, p. 307; North, 1999). They operate as non-profit membership organizations where participants exchange goods and services using their own local virtual currency based on a credit and debit entry system. During a typical trade, the seller's account is credited, while the buyer's account is debited with whatever amount the two parties agree on. The currency is created as trades take place, so a zero balance does not preclude one from trading: there will simply be a negative account balance on one side of the trade. This initiative was started in Vancouver Canada, by Michael Linton and Davis Weston around early 1983 (Boyle, 2013; Cooper, 2013; Peacock, 2006). Its preceded by a sudden increase in unemployment and low economic activity, following implementation by the Canadian government of a policy to limit fishing quotas. The idea behind the local currency was to compensate for the reduction of national cur-

rency in circulation and stimulation of economic activity to alleviate the adverse impact of unemployment.

Some commentators consider LETS to be a failed innovation. For example, this study was part of my Science and Technology doctoral studies at the University of Edinburgh. During the board review, senior scholars in the department perceived the Edinburgh LETS as lacking any depth of knowledge. One of went as far as stating that the scheme attracted a “bunch of loonies,” who thought they could change the world. Undermining LETS in this manner was in a way similar to the prejudices that developing country research subjects are routinely subjected to by international development agencies (cf. Ferguson, 1985; Escobar, 1988). Similarly, international development pedagogy is largely shaped by priorities set by international organizations, and commercially-successful technologies and innovations measured by a single variable, profit (Anderson, 2009).

After gaining popularity in Canada, the schemes were introduced in the U.K. around mid-1990 s. A couple of years after their introduction, the Edinburgh LETS (www.letsedinburgh.org.uk) commenced operation in 1992. Its currency was named “the Reekie,” in honor of “Auld Reekie,” a nickname for Edinburgh. At its conception, it had a membership of 120 but stood at 189 as 2018 began. Most similar LETS in the world usually set the exchange rate between their currency and the national currency at the ratio of 1:1. However, the Edinburgh scheme set theirs at £1 = R5 (R-Reeky). As is the case with similar schemes the exchange rate is nominal, there is no physical convertibility between the two currencies.

4.2. The LETS market for low-use, low-value goods and services

At the Edinburgh LETS, members trade goods and services during trade fairs held every 1–2 months. Most of the goods on sale at these fairs involve low-value, second-hand clothes, household utensils, old CDs and other things one expects to see at a garage sale. New goods consist of a few handicraft items, such as mats, baking, paintings, and a few small value items which most of my respondents identified as unwanted gifts. Services included hand and body massages, gardening, computer programming tutorials, offering the elderly and disabled lifts to attend hospital appointments, pet sitting, and childcare. More useful services included: plumbing, building, carpentry, and general maintenance. However, these services were predominantly offered by men, though there were few male members who participated in the scheme. As a result, there was a limited supply of most essential services. Overall, the scheme was not self-sufficient; many raw materials could only be sourced outside its economic sphere. One had to go to retail shops, where one obviously had to pay in pounds sterling to purchase massage oils, spares parts for plumbing, general maintenance, building material and the transport costs, etc.

4.3. The LETS currency as a medium-of-exchange

An interesting feature of the LETS virtual currency is that one does not necessarily need to possess it in order to engage in a spot transaction. This *non-excludability quality* of the virtual currency is similar to other findings in relation to digital innovations (Faulkner and Runde, 2013). In contrast, the capacity of government issued money (M0) to act as a medium-of-exchange is conditional on its availability. Consequently, a lack of money aggravates financial shocks, particularly where households are experiencing consumption deficit. This is a phenomenon that occurs for poor households, in which consumption needs exceed actual consumption (Zeldes, 1989). Based on the above quantitative constraint, one may conclude that the effectiveness of government issued money's medium-of-exchange function increases in conjunction with

⁴ Government monetary statisticians classify it as M0 but in some countries it is referred to as M1 (Clews and Hoggarth, 1990). It provides a means through which monetary authorities can influence short-term interest rates. In addition, it is also used to calculate the velocity of monetary circulation, as the value of consumer expenditures divided by M0. An upward trend in this ratio is usually explained by an increase in technological innovations in payments, such as ATMs, check books and debit cards, which lead to a reduction in use of cash for payments (Janssen, 1998, Janssen, 2013). A decrease signals over-reliance on cash to purchase consumer goods and services, as in developing countries. A more in-depth discussion on this topic is offered by Clews and Hoggarth (1990), Kavajecz and Anderson (2003) and Mishkin (2004).

increases in the quantity of money that one has – representing financial security, but declines in step with decreases in the quantity of money that one holds. This goes against the neoclassical economics notion that the primary function of money is its medium-of-exchange role as a neutral and value-free means to lubricate the exchange of goods and services.

4.4. *The LETS currency and the issue of equality-of-value in transactions*

There was a deliberate attempt by the Edinburgh LETS committee members to create equality with respect to value in the exchange of goods and services related to its currency. For example, they recommended that all service providers must charge R5.00 per hour for all services. In a January 2013 annual meeting, this issue proved to be a bone of contention. Approximately half of the attendees were in favor of a uniform charge rate, and their support was based on the argument that all human beings are equal. The other half argued that members should be allowed to negotiate variable rates depending on their different skill sets. This was a contentious subject with the two camps unable to come to agreement. As a compromise for the uniform pricing dilemma, some members suggested that individuals should be allowed to make fractional charges in Reekies and Pound Sterling (£) to compensate them for the direct costs relating to £ purchases from local retailers.

Members with high-demand skills were reluctant to hold high Reekie balances. Many reported they found it uneconomical to dedicate time and skills to activities where they got paid exclusively in Reekies, because they had disproportionately high none Reekie-denominated financial commitments. This phenomena can be explained by the *hierarchy of money theory*: that the degree to which a new currency will be accepted is dependent on whether the state will accept it as a means of payment for tax (Bell, 1998; Minsky, 2008). However, based on this study I would add that the demand for the LETS virtual currency is conditional on market size and complexity in terms of its ability to provide the widest range of goods and services in quantities and qualities which meet their needs. Clearly, LETS does not meet this condition because of its reliance on low use-value goods and services.

The pricing debate demonstrates that economic rationality is mediated by non-monetary factors, such as moral values and social intercourse between trading partners. Some of the participants have specific views on the equality of value, while others are constrained by personal and practical economic restrictions. The divergent views on pricing and values of goods and services clearly did not converge on their own, so the currency-issuing authority, LETS, had to resort to moral suasion to promote value equality. This throws caution against the positive values associated with the digital revolution as espoused by many (Hart et al., 2010; Maurer, 2015). Future innovations for inclusive monetary innovation in developing countries should engage around the question of how values can be deliberately imbued in money, and to find technical and non-technical means to mitigate the degeneration in its capacity to act as an effective means of exchange at low income levels.

4.5. *The LETS currency as a unit-of-account*

In one of the numerous conversations I had during the Edinburgh LETS trading fairs, a woman told me that she saw herself as an embodiment of the Reekie currency. Her comments made me wonder: why can't money (M0) amplify qualitative attributes such as values and identity? This could be achieved by combining its unit-of-account role with an individual's identity, as she intimated. This is interesting in that it may provide a means to mitigate the quantitative limitations of money.

Other evidence suggests how this may also be problematic. The Edinburgh LETS has an online feedback system that members are meant to use to rate their experience after every transaction. This system is a potential means through which identity could be merged with transactions, but a lot of people did not bother making use of it. I asked one member why that was the case. She explained that she would not be happy to provide feedback especially if it were negative, because that would create disharmony in their small community. In a way, the computer system conflicted with social practice, in that participants preferred to keep such rating mechanisms as private memories, as opposed to publicly-shared experiences. Based on my experience developing electronic payment systems, it seems technically possible to preserve privacy and confidentiality preferences while still being able to provide information to help others to make ex ante financial decisions.

This discussion raises interesting questions relating to privacy, confidentiality and anonymity, all of which are central to the emergence of cryptocurrencies, particularly Bitcoin,⁵ which some have touted as the future for financial inclusion in developing countries. Its promoters believe in non-government interference in private economic lives and decisions. Their core value of anonymity directly conflicts with LETS participants, who have demonstrated an interest in interlocking the unit of account role of money with their identity. Unlike the “anonymity at all cost” principle as is the case with Bitcoin, LETS members' concerns are limited to privacy and confidentiality to preserve community harmony and cooperation both of which happen to be the core foundation of their currency. The implication of this is that if cryptocurrencies are to work in developing countries, then they may have to revisit their core principle, and adapt the anonymized public ledger system (Meiklejohn et al., 2013; Maurer et al., 2013) into a de-anonymized one that preserves confidentiality and privacy.

The *anonymity problem* discussed above in relation to cryptocurrencies also applies to government-issued money. If one wants to engage in illicit activities, then it makes sense to use notes and coins because they anonymize the identity of the transacting parties and their transaction details. Government issued money's unit-of-account function captures the quantitative attributes of exchange, but fails to account for identity and social attributes. In the face of cash constraints, poor individuals must rely on a mechanism that mitigates household consumption deficits through delayed reciprocity and gift exchanges. This observation suggests that, although neoclassical economists consider the unit-of-account role of money to be a secondary one, Keynesians, social scientists and anthropologists may be right in viewing it as the primary function of money. The potential to merge the unit-of-account with identity presents an interesting opportunity for possession of money not to be a precondition in spot transactions.

4.6. *The LETS currency as a store-of-value*

The LETS virtual currency temporarily stores economic value. One can use it to buy just a few new products, and many low-value goods, but predominantly it embodies non-economic value representing care and equality. A lot of participants whom I interviewed preferred low Reekie account balances. This particularly applied to individuals with very high negative balances, most of whom were disabled and elderly. They expressed feelings of guilt, and stressed the need to give back to the community, by reducing their negative account balances. This can be achieved by providing services to others, and yet many of them struggled to do so because

⁵ For additional information, see the technical article written by the pseudonymously-named author, Satoshi Nakamoto (2008).

of old age and disability. The LETS treasurer stated that they have a social fund specifically set up to assist the elderly, disabled and other members who are less able to contribute to the scheme. Judging from this, LETS members' Reekie balances seem to represent an individual's contributions and obligations to self and others.

The relationship between government-issued money and the LETS virtual currency's capacity to store economic value has a diametrical relationship with quantity. The higher the quantity of money (M0) that one has, the more effectively money is able to store economic value for the individual. But, in the case of the non-government-issued virtual currency, the compulsion to maintain low account balances means that its capacity to store economic value is reduced. What remains unanswered is the tension between the storage of economic value and social values. For example, if holding low Reekie balances is virtuous, in the sense that it demonstrates contributions to others, how then would one be able to save for old age when they are less able to contribute to the scheme? This is a difficult issue.

Overall, one can conclude (again) that money (M0) is most effective at storing economic value in relation to the more privileged, higher income population segment, and less so when it comes to the under-privileged, low-income segment. In terms of contributions for future monetary innovations in developing countries, the tensions suggest that studies on financial needs of the poor could be enhanced by including the monetary practices of the rich. This recommendation is based on the discussion about the disproportionately high negative Reekie balances associated with members who are less able to participate in the scheme. It brings to light how excess economic gains by others are directly connected with extraction from vulnerable members in society. Moreover, the LETS social fund presents an opportunity for monetary regulators to find ways to increase government-issued money's redistributive potential.

5. Other issues

5.1. Direct and indirect reciprocity, and free riders

Reekie-denominated exchanges are based on *indirect reciprocity*, a form of exchange where there is no expectation that the donor of a good deed will be rewarded by the beneficiary of his deed directly, but by another member within a community (Mohtashemi and Mui, 2003). In addition to indirect reciprocity, direct reciprocity is also commonly used by behavioral economists as a measure of cooperation. For example, an experiment conducted by Herrmann and Gächter (2009) found that in general close to 50% of people cooperate, while the behavior of 25% was difficult to explain, and the final 25% were uncooperative free riders.

Interestingly though, the Edinburgh LETS' level of cooperation was over 95%. To work this out, I calculated *net trade*, the difference between debits leading to negative account balances and credits which create positive account balances. The difference between the two was a small negative balance. This implies that, overall, there was a negligible number of *free riders*, apparently composed of a few disabled clients or new members who did not have the opportunity to start offering services and reciprocating value within the community. The LETS treasurer commented on the risk that some people may decide to just take from others without contributing anything: "It's not real money you see," and also "What would you take, it's all second-hand goods."

Unlike the LETS virtual currency which mediates trade in low-value goods, government-issued money handles more valuable goods and services. Thus, cooperation is bound to be critical,

especially in cases where future innovations extend the use of money from on-the-spot to delayed-reciprocity transactions. Currently, government-issued money-denominated transactions are based on direct reciprocity, whereby a buyer or debtor is expected to make direct payments to the provider of the goods and services, unless they reassigned to someone else. Failure to honor debt or payment of purchases will lead to the enforcement of relevant regulations or refusal by sellers to supply the purchased goods or services. This suggests that strong institutional and technical safeguards are required in order to provide necessary incentives or punishment to promote cooperation.

5.2. Currency management and institutional trust

All the informants in this research study did not put any emphasis on the importance of trusting the person to whom they offered goods and services. They believed the system has the means for their contributions to be reciprocated, so individual trust was therefore viewed as institutional trust. However, recipients of certain services, such as body massages and babysitting services were cautious about trust. Their demand for validation of trust increased where there was an element of personal risk. One informant shared a past incident, where a male member of LETS became sexually inappropriate while he was massaging a female colleague in her home. Fortunately, he left when she asked him to leave. This is an indication that, if such incidences are widespread, then one could argue that the central authority of the scheme did not have adequate institutional safeguards.

In addition to the above infrastructural concerns, the Edinburgh LETS faced serious financial challenges. For example, in 2013 their bank account balance fell to less than £200.00. There were limited professional skills available, and several committee member positions remained vacant for a considerable period, nor were there permanent management positions or available office space. On numerous occasions, meetings were conducted in local cafes, the library, and individual committee members' homes. Viewed from the corporate world, the management decision-making process was also inefficient. Perhaps this was to be expected, because of the strict democratic decision-making process that was in place. It involved consultation with all the members for decisions that some consider to be trivial.

6. Concluding discussion

In this exploratory study, I set out to evaluate the technological properties of a non-government issued virtual currency, but with the primary aim of drawing lessons which could contribute towards future research and innovations for inclusive monetary technologies in developing countries. I argued that social constructivist approaches, together with theories about the nature and origins of money failed to adequately recognize the reality of present-day technologies. Money is increasingly converging with information technology. The promises of future technology have led to a concerted drive to displace old technology – especially notes and coins – with a new technology – electronic money. This is based on the widespread arguments that this would eradicate financial exclusion. But, I have argued that it will be difficult for democratic or inclusive monetary innovations to emerge if the unbanked are not meaningfully involved in shaping future monetary technologies. Both the framework forwarded, and the case study selected were aimed at generating new insights from technologies that are able to prioritize human values and practices over ones that seek to profit from intermediation in the presence of poverty.

The findings from this study paint a dim view of the technocentric developmental finance perspective. It diminishes the

intended role of the state, and advocates intervention by private entities to address the financial needs of the most vulnerable segments of society. This is supported by the findings reported in this work regarding the various ways in which the central authority – the Edinburgh LETS Committee – had to adjudicate between divergent interests in order to preserve and enforce value equality for labor and exchange. Though the problems were not very severe, this study identified consumer protection risks and personal safety concerns during trades. While individuals in the Edinburgh scheme did not face major problems, poverty and deprivation may exacerbate consumer protection risks, which can lead to the exploitation of vulnerable people (Stiglitz, 1993). Developmental Finance and Finance, more generally, are awash with such problem, such as the recent subprime mortgage scandal, mass suicides in Andhra Pradesh, and deliberate mass loan defaults in Bosnia (Bateman and Chang, 2012; Taylor, 2012; Shylendra, 2006).

Concerns regarding relevance in developing countries of research based on an Edinburgh case study can be explained based on the conflicting values, goals and aspirations of the LETS members. These contradictions suggest that the relevance of wider social structures within human institutions become prominent only after the technology design stage, when users must decide whether to adopt and faithfully (or unfaithfully) appropriate a technological artefact, or not to adopt it at all. Thus, new monetary innovations would most likely emerge from embracing uncertainty and experimentation than formulaic approaches or social determinism.

My observations dovetail with DeSanctis and Poole (1994) adaptive structuration theory. It posits that technological artefacts embody their own structures separate from social structures within human institutions. These technology structures are composed of a technology's functional attributes and *spirit*, which refers to the goals and values that underlie a technology.

For the case of the Edinburgh LETS, this study revealed technological properties, including both functional attributes, goals and values of their currency to be a spot-reciprocity and delayed-reciprocity unit of account which measures an individual's obligation to self and society at large. The ability of the Edinburgh LETS virtual currency to be used by those who do not possess it stands in direct opposition to the fact that the capacity of money (M0) as a medium-of-exchange depends on its availability. Furthermore, its medium-of-exchange and store-of-value functions are mutually exclusive at low-income levels. Consequently, money (M0) discriminates against the low-income population segment, comprised of the elderly, disabled, and others with limited skill sets or economic means. Thus, the question for future monetary innovations is about how equality and redistributive values can be built into government-issued money.

This study clearly is not about the ontology of money. And yet, it has generated some new insights and ideas that are reported in this article. Nevertheless, some of the findings of this research suggest that, by discrediting the commodity theory of money, anthropologists and social scientists may have “thrown out the baby with the bathwater.” I concur with the argument that the origins of money is not in commodities, but based on my findings I argue that money may actually be the commodity out of which it is made. As a result, I propose that one can think of this view as a *neocommodity theory of money*, in which money's primary purpose is its store-of-value function. By value I mean economic and non-economic values held by its issuers. As I have explained, a commodity does not necessarily have to be tangible, as is the case with the intangible properties of a virtual currency. In additions, bank money is comprised of digital credit and debit entries, and electronic money involves digital objects also. Thus, the proposed neocommodity theory of money suggests future research priorities that underscore materiality of both tangible and intangible forms of money.

Drawing on the sociology of scientific knowledge framework for evaluating the technological properties of technological artefacts, I explored the technological properties of a non-government issued currency used by the Edinburgh LETS. I compared it with government-issued money, and through this was able to contest the expert claims by neoclassical economists about the properties of government-issued money, and offered a hypothesis to address questions regarding the monetary needs of the unbanked poor and the future of money in developing countries. This is embodied in my quantity, quality and public authority deficit (QPAD) hypothesis. With this, I consolidated the disadvantages from the use of money, especially its quantitative limitations, the inability to account for qualitative attributes of transacting parties, and the subordinate role of developing states in addressing the monetary needs of the unbanked poor while international financial institutions and their affiliates have been playing the role of an all-powerful state in developing countries. Future monetary innovations in developing countries which do not concurrently address these three problems will most likely be unsuccessful, in my view.

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