Building an Alternative Social Currency: Dematerialising and rematerialising digital money across media

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ABSTRACT
This paper reports on the user experience and design of physical and digital forms of a mixed-media local currency. We reconceive digitally mediated transactions as social interactions and report on the development of conceptual designs informed by user research and interactive workshops. Our findings show that use is strongly tied to conceptions of locality and community, markers of identity, information exchange and the digital and physical forms as tools for shaping interactions. The form of the currency can make the invisible visible, exposing our identities and values, business models, and the details of the transactions themselves. Our analysis stresses the need to provide opportunities for extending social interaction, making more local connections and deriving the best value from those connections, without insulating individuals from each other, or from the wider geographical context. Themes that emerged from the user research were visualized as conceptual designs for digitally augmented media, allowing us to explore the monetary transaction at three levels: the material, as interaction between two parties, and the context of the transaction.

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Interaction design; digital wallet; digital money; mobile payments; community; alternative currency; sustainability; prosocial computing.

ACM Classification Keywords
H.5.m. Information interfaces and presentation

INTRODUCTION
The recent turmoil in the world financial sector has made understanding and innovating new and more sustainable approaches to financial services a topic of serious concern. New forms of digital interaction, infrastructures and connectivity give rise to opportunities in making financial transactions in different ways and with different operational models that offer the possibility of transforming the marketplace and the communities that they are used within. One such area that has been affected is the way that users can now access and use digital banking and payment services. This change is not limited to the traditional banking sector, and new innovators and community groups are now able to deploy these technologies in novel ways that are more suited to their own purposes, needs and values. These new opportunities sit within a larger economic, social and cultural context, in which localism and community development are increasingly seen as important drivers of economic stability and sustainable development. One way that local communities can provide some steer on these drivers is through the introduction of local currencies. There are many reasons why communities might wish to do this, including a move to "humane, socially or environmentally responsible lifestyles" [5]. Practically, these usually try to create local supply chains, sourcing daily needs locally and spending locally [7].

Little is understood about the use of physical and digital forms of local currency, what it is used for, or its settings of use. For technology to play a meaningful part in economic well-being, it is necessary to understand its role in supporting local economic communities. Issues around the implementation of such local currencies in ways that foster these economic and cultural values, while retaining monetary value, and the intrinsic features of usability required for a variety of forms of financial transaction are key to making these systems practically viable. To this end, we are conducting ethnographic and design research studies with users of a local currency in the UK, the Bristol Pound.

RELATED WORK: CASH, COMMUNITY AND MOBILITY
Although it is used as a means of value transfer, money is embedded in social practices and has situated social meanings and uses that are constantly (re)negotiated [17]. Answers to the question '*what is money*?' vary, yet economists, sociologists and anthropologists agree that its exchange requires trust and acceptance between parties [14]. The study of money and its exchange is therefore necessarily a study of how meaning and value are assigned by those who use it. One example of this in the HCI literature is Mainwaring et al.'s ethnographic study of digital money use in Japan, which shows how cultural aspects can be leveraged to design mobile payment systems that fit with the context of its users [8]. Illustrating this point, the paper opens a discussion on how to minimize commotion during digital transactions while also upholding "aesthetic pleasure". Studies of mobile money use have a

strong tradition in developing countries. Kenya's M-Pesa, a mobile phone payment system has been studied in detail (e.g. [10]) with attention to key themes such as trustworthiness and security [11], and how the system addresses the specific financial needs of developing economies [2]. Currencies may also be tied to particular locales, one example of this being virtual currencies in gameworlds (e.g. Linden Dollars), which hold the strange character of being purchasable for real money, but only holding practical value within the game. By studying how online gamers in China perceive, obtain and spend virtual currency, Wang and Mainwaring explore how the gaming experience is shaped, heightening its realness, trust, and fairness [15].

Like virtual currencies, local currencies serve small regional areas, rather than national economies. As alternative (or complementary) currencies, a number of these have emerged internationally with deliberate aims toward advantaging local economies and environmental sustainability [7]. There is a large literature on such 'non-fiat' currencies, or currencies that exist outside the traditional baking sector (see for e.g. the Nobel winning economist, Hayek [6]), with heated debate on the relative economic advantages or disadvantages, but little consensus. What is interesting in all these studies is that none have studied a currency in both physical and digital form, such as the Bristol Pound.

Our approach builds on ethnographic studies and participatory workshops with users in which we research through design (c.f. 23) to better understand our user groups. We bridged our qualitative findings from the ethnographic study and the conceptual designs through two iterations of sketching, probing and reflection with two different user groups. By sketching we are not referring to drawing, but rather to assembling low fidelity representations of technologies that are incomplete [18]. We employ the concepts of sketches and probes in our studies as tools to "provoke inspirational responses" [22] from the users that serve as "clues about their lives and thoughts" [21].

CASE CONTEXT: THE BRISTOL POUND STUDY
The Bristol Pound (£B) was launched in September 2012 with a deliberate intention to act as an instrument for social change. Its aims are to "build community connections and work for people not banks to create fairer, stronger, happier local economy" (Bristol Pound website, 2013); this is set in the context of the city of Bristol, which is the 8th largest city in the UK, with a functional urban population of around 1 million. The £B is a complementary currency; it is not intended to replace sterling, but to be used alongside it. One Bristol Pound is equal to £1 Sterling (£GB), and each £B is backed by a matching Sterling fund to ensure that it retains value. Acceptance of the Bristol Pound is growing rapidly, gaining strong institutional support and infiltrating city infrastructure. The currency is now being accepted for bus

travel, housing payments and payment of local taxes. While Sterling can be transferred into £B, there are penalties and limitations on re-purchasing Sterling. Technically, the £B is a voucher, and traders are not required to accept it; however, around 730 local businesses have registered with the organisers to accepted it, with around £B350K of the currency in circulation just 2 years after its launch.

Transactionally, the Bristol Pound is a 'mixed-media' currency: payments can be performed using physical printed notes, online via a browser, and using a platform-independent text messaging system on mobile devices (Txt2pay). Anyone can exchange sterling for various denominations of Bristol Pound notes, but to participate in digital transactions (online or Text2pay) users are required to become 'members', with a special account to mediate transfers. Individuals and businesses within a 50 mile radius of the city of Bristol are eligible for membership, differentiating digital transactions from Sterling or paper £B note interactions by their spatial restrictions.

This research is part of a larger programme addressing the socio-technical aspects of financial transactions that bypass traditional banks. In this regard, we were interested in examining the values and needs of the community of £B users, traders and the currency administrators, and exploring the implications for designers to reflect and support these patterns of use, practices and values in digitally augmented media. Our own ethnographic interviews and observations were conducted over a 6 months period to explore the behaviour, patterns and practices around £B use in context. Participants include individual users and traders, as well as the Bristol Pound team administering the currency. The findings in this paper are based on the authors' personal shopping experiences using the Bristol Pound, participant observation through involvement with the Bristol Pound team in their office, and formal and ad hoc interviews with users. Following our initial analysis, and drawing inspiration from the design implications [20], we also conducted design workshops with users drawn from a pool of representative users and non-users living in Bristol, as well as with the Bristol Pound management team. These workshops involved the use of early-stage technology 'probes' [19], in which the prototyped designs were demonstrated and explored by users, who reflected their experiences back to the research team, and in so doing, enriching our understanding of the issues surrounding use of digital local currencies, as well as giving us further insights into the design space. In reporting the work, we begin with an exploration of our user research, moving on to explore the findings that emerged from our design workshops.

USER RESEARCH: FINDING OUT WHAT IS IMPORTANT TO THE COMMUNITY
Our findings show that the Bristol Pound plays a role in maintaining social cohesion and connection among its user community. From the user research (observations,

interviews and surveys) the significant themes emerged as (1) face-to-face transactions, (2) digitally mediated payments (3) ethically driven (4) building community.

Symbolic Values: signaling localism and independence

The artefacts that we use (and how we appropriate them) demonstrate–and allow us to visibly show–the meanings, social significance and values that we invest in our social interactions. Use of the Bristol Pound, with its marketing around support for *local* and *independent* businesses, appears to be no different. Our use data shows how notions of locality and independence are important factors that shape how the currency is used and what it means to be using it. Both physical and digital transactions in £B are tied to geographical location and in making payments to traders, users are practically–and very visibly–engaging with a business model that is locally owned and operated (from a shop, stall or farm), rather than controlled from a national or global headquarters. As one member explained: "*Whenever I see a sign like that ["We accept Bristol pounds"], I know it's usually an indicator that they're independent and I'd rather shop there than somewhere that didn't have that sign up.*" [iBPu01]. Accepting and using the Bristol Pound is a clear differentiator that allows users to select from among the thousands of businesses and individuals that serve the Bristol region. Its use also sends signals about the business and the individual, and the values that they uphold. By accepting the currency, businesses are able to rapidly and simply communicate information to customers about how their business operates, and allows customers to signal their support of that model simply through making a transaction. This is subtly different to brand identity, which carries somewhat similar value signals. This choice of payment option (as £ or £B) has a communicative function that is different to simply allowing the user to choose to purchase a brand that users might identify with. In this, users and traders make and shape interactional choices that signify values of localism and independence. Moreover, these values can be almost effortlessly expressed simply through a choice of payment currency.

Building community identity: people and place

The people using the Bristol Pound describe themselves, or are described, as having an identity that upholds common values in line with the scheme, such as ensuring that local businesses thrive and local communities are sustained. As a member of the £B team described, using local independent traders requires trust, word of mouth and social bonds [IBPu03]. Interactions reinforce social bonds, as one of the interviewees referenced the importance of being part of a self-reinforcing community of likeminded people: "*I live in the south where there's quite a big community spirit and a lot of the stuff they do is all tied around the Bristol Pound… I got quite involved with the community through the currency really…. Even if you're just buying a pint because you can pay at the tobacco factory with Bristol pounds you*

feel like you're part of something bigger than just going down the pub. So that's good" [IBPu01].

This reference to a unique identity appears to go beyond individuals and involve the locality or place itself. People within localities are described by users and the £B team as having particular characteristics, for e.g. "*Bristol's get up and go spirit… Pride of place and their sense of togetherness*" [vBPa01]. This role of place is institutionalized in the £B membership criteria. Primary producers can only obtain membership if their business model is seen to fit with the Bristol Pound values and they operate within the local economy. The Bristol Pound team takes membership very seriously, and decisions are considered on a case-by-case basis against how they would fit into the community of users; they are evidently very conscious of how expectations around place and member identity are highly interdependent.

Reinforcing connections: behavioural change and information exchange

Using the currency places users within a developing social network. This is in part that users may begin to feel part of something bigger, making conscious decisions about whom they give their money to. Our informants described how they would do research, finding local suppliers using the £B, and being more conscious and aware of where they were shopping: "*And then I saw they accept the Bristol Pound so I went there more regularly… there is the conscious effort to go the deli instead of going to Tesco*" [IBPu01]. However, there are also less transient and emotional ties that build these social networks. Cash payments require a physical handover, and this is reported as supporting networks of trust and in an acknowledgement of shared values. This is also true for the Text2pay system: going digital does not have to mean becoming incognito as it is still a face to face method of payment. However, this extends beyond visible and conversational interactions, as more information is exchanged and saved than would be the case if it were a transaction with physical notes. This connects to a literature on the informational role of money [3] in which digital forms of money are no longer indistinguishable as an aggregated and standardized measure of value, but "as digital transfer retains more of the information than fiscal exchange" (ibid.: 46), audit tracking and other forms of transactional information are communicated and retained. The Text2pay SMS message that is sent between the mobile devices used carries information connecting the transacting partners. This allows forms of relationship management with customers, allowing traders and the Bristol Pound team to send them vouchers, invite them to special events or connect them to other social media, further embedding them in a web of connections within the Bristol Pound user community.

Physicality: in/tangibility and exchange

The fact that payments can be made digitally or using

physical token of value offers users multiple ways to make, and manipulate the ways that they interact around transactions. While their interactional features are more complex, digital payments are relatively restricted in their opportunities for appropriation and interrogation. The tangible and aesthetic qualities of the physical notes promote interest in the scheme itself and give visibility to their aims, e.g. through local artists' work on the notes. Unlike their digital counterpart, notes do not require a specific technology to use, or formal community membership criteria to be assessed, and users are familiar with their operation. This opens up the scheme to a wider user group, further increasing its reach and acceptability. The physical form for the notes even allows users to manipulate purchasing behaviour. We have observed this specifically in encouraging bigger purchases: Bristol Pound team members have described how they have paid in denominations of £20 notes for small purchases, because the receiver will now have £20 to spend, rather than a smaller amount, further circulating the currency in the local community.

Notes can also leave the local area and reach a wider audience without it necessarily being spent. Indeed, the physical notes are curious and collectable, occasionally being sold on eBay for prices above their face value. The attractiveness of the physical notes serve as discussion points and for one Bristol Pound member, was their first contact with the scheme: *"My friends said 'Oh look what I got' and they just had them almost as souvenirs. And then I looked into it further and I joined the credit union and they helped me set up a Bristol Pound account."* This discussion about the 'special' status of notes is itself interesting, as we have observed users engaged in discussions about where they plan to spend them, and on what. This is not just a matter of working around a limited set of trading outlets that accept £B, but users seems to regard the currency as a form of 'special money' [17] with different characteristics to £GB.

DESIGN WORKSHOP

Based on the results from the initial user research, it was clear that in this community, a transaction was more than handing over cash or plastic, or just a mechanical exchange of money for something else. To explore three dimensions of digitally mediated payment transactions, we picked up on three of the issues that had been identified: a) the role of infrastructure in enabling transactions, b) interactions at the point of transaction, and c) the social context within which transactions are embedded. Three lightweight technology probes were therefore developed to further explore each of these themes respectively: (1) Money Memory, (2) Digital Wallet, (3) Shape Changing Payment Device. Participants were divided into small groups and asked to illustrate scenarios for each probe in which the example is used as payment, exploring how it might feel to use this method of payment, when this would be a good way to pay, and when

it might not. Following the separate group discussions each group presented their scenarios to the larger group for critiquing and further discussions. Each group varied in how closely they followed the scripted questions in their explorations; we did not attempt to shape this too closely, as we were interested in their responses and the ways that they chose to interpret the design question.

Money memory

The "money" consisted of a small set of physical paper notes from the Monopoly board game. As demonstrated in figure 1, various denominations of the game currency were modified by pasting images of imaginary "purchases" on the reverse. In figure 1, the top note indicates that it had been used to purchase three coffees, the middle note a loaf of bread, and the bottom had been used to purchase jewellery, a magazine, paints, paper, etc. We then asked Group1 to imagine that the printed notes could remember what it was used for.

Figure 1: Money that remembers what it was used for.

As a response to the probe, Group 1 designed a paper prototype of a mobile app they named 'MeMoney' (see figure 2). The main functionality of the app allowed users to build their own spending profile so that they can visually track their spending.

Here, each transaction is represented by a photograph of the item purchased and the collection of photos build up an "infographic" forming the user's spending profile. Each photo represents a pixel within an image of the user's face, which can be zoomed into, described by the participants as being "like a Google Map".
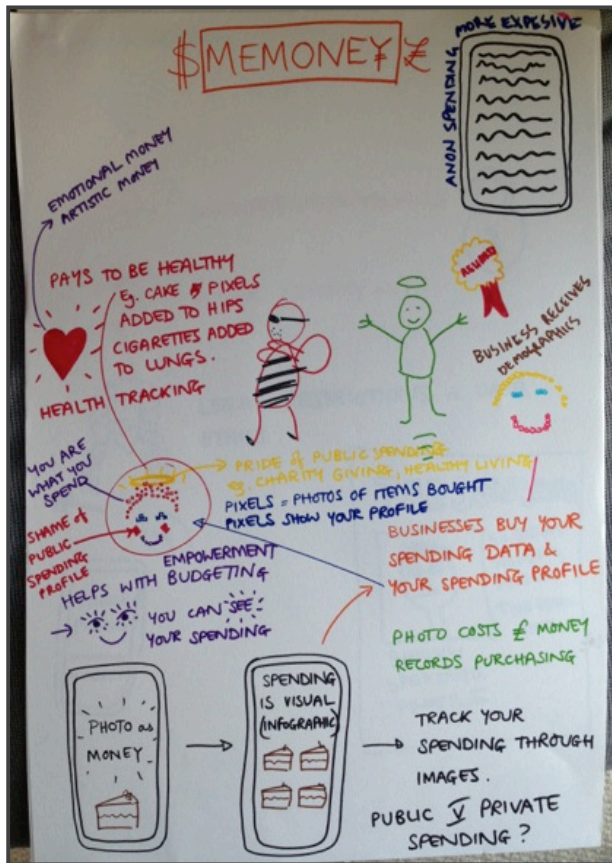
Figure 2: Sketch for MeMoney

In the final group discussion, MeMoney raised considerations around decision-making when spending money, as well as the implications of making spending information visible to others. On the one hand, participants understood the personal benefits of using the infographic as a tangible reminder of what had been bought. They even suggested a potential application for tracking their health based on keeping track of what they had consumed. On the other hand, participants voiced concerns with the public availability of this data, wondering who would benefit from (or potentially exploit) this data – whether it was everybody using the app, wider society, or businesses. Participants, imagining themselves as users of this prototype, also considered the emotional outcomes from making their spending public by identifying a trade-off between the power to track personal transactions against feelings of pride or shame attached to the transactions. They talked about a type of "Peer-review" transacting, in which others may evaluate these spending behaviours and make judgements about them. This prompted the designers of MeMoney to clarify that the transaction data can become private and hidden from others, but in order to do so, you would have to pay a higher amount for your purchases.

From the group discussion around the MeMoney prototype we distilled three guidelines that would inform our subsequent conceptual designs. These were to: 1) Represent transactions visually, 2) Design for a kind of spending profile that can be shared with others, and 3) Build in a sensitivity to publicly available data.

Digital wallet

This probe was designed as an interactive mobile application (app) created with the design tool 'POP'[1]. Photos of Swedish Kronor and paper cut-outs representing functional and navigational features of a user interface were uploaded and linked to allow real-time interactive transitions between screens. The transitions were intended to simulate the possible journeys through the interface.

We asked Group 2 to imagine that this is an implementation of a digital wallet, which, in the prototype, allows the user to do two things: a) See the money (represented as notes) they have in their wallet, and b) Pay someone 20 Kronor (see figure 3).

Figure 3: Digital Wallet

In response, Group 2 found it difficult to think beyond the app as it was designed and to generate ideas that were not app based. As might be expected with a more highly developed prototype, participants tended to critique the look and the features as they were implemented, rather than considering its conceptual development. However, this richer interactional space also allowed participants to consider it *in use,* rather than as a more abstract conceptual tool. In this respect, our participants were particularly critical of how using the app for payment would adversely affect the social interactions around the face-to-face transaction.

As an example of this, a participant demonstrates in Figure

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[1] https://popapp.in/

4 the behaviour she reported commonly encountering during phone-based £B Text2pay transactions. While she normally expected transactions with her local shopkeepers to involve the buyer and seller smiling and establishing eye-contact with each other, here she demonstrated the use of the phone during the transaction as an impediment to doing so. In her demonstration, the buyer is entering payment information for the transaction and focusing on the phone. At the same time the seller, while waiting for the buyer to complete their task, could be engaged in a number of other activities, such as having discussions with co-workers or other customers, making coffee and checking equipment. Transacting in this way was considered embarrassing, uncomfortable and counter-intuitive.

Figure 4: Eye-contact avoidance during phone transactions between buyer and seller. a) imitating the buyer entering payment information (left), while simultaneously the seller is distracted with other activities during the transaction (right).

From the group discussion around the digital wallet probe we distilled a guideline to inform our subsequent conceptual designs: To preserve the natural interaction that fits with the social protocol of a transaction.

Shape changing payment device
Adapting the mechanical puzzle known as Rubik's Magic[2] we mocked up a shape-changing payment device. The square tiles of the puzzle were modified by pasting images containing product information, an account balance, a scanning device and a "buy" button onto the foldable panels of the puzzle. Visibility of the images depends on the object's physical shape. Five possible actions were presented for the use of this payment system. Users could check their balance, scan a product, see who they were buying from, see the product scanned, and buy the scanned product (see figure 5 for two possible configurations of the device).

Figure 5: Shape changing device

In response, Group 3 were extremely playful with the possibilities of this device, describing it as a "weird shape" and "a bit futuristic." While Group3 found it easy to suggest several uses and behaviours for the device, they found it harder to specify concrete implementation details for their ideas – possibly due to the lack of familiarity with such devices in our everyday lives. Group3 imagined this device as a wearable system that knows who is wearing it, that grows, develops and evolves with the wearer. It was not considered "off the shelf usable" but a device that adapts to the user depending on the various ways in which they deploy it. Group3 named this device MyShap£ and described it as a benevolent helper while shopping: "Your flexible friend - warm and reassuring. Helps you make decisions." The shape-changing ability of the device was suggested as a way of controlling spend: different permutations of the shape allowing spending on different types of products.

In the general group discussion, issues of control surfaced similarly to Group 1's MeMoney prototype. MyShap£ was recognised as a powerful device that could take control of the user's spending, prompting one of the participants to ask, "Does the device control you or do you control the device?", and another to comment, "Sounds like a parent not a currency." In this case, these value judgments are seen to be made by the device rather than by some "public" as in the case of MeMoney. Related to the flexibility of the device, participants envisioned that it could be "your own bureau du change," allowing users to switch between different currencies and perform transactions using different currencies. Participants also imagined the device as a decorative element, suggesting that it could be worn on the body as a bracelet, a pin, or necklace that could change more than just its shape in response to its environment. For example, changing colour, temperature or texture to alert the user to certain cues in their surroundings.

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[2] http://en.wikipedia.org/wiki/Rubik%27s_Magic

As we were not in a position to develop for the shape-changing attributes of the device, we distilled the following guidelines from the group discussion in order to inform our subsequent conceptual designs: 1) Offer the possibility to switch between currencies, and 2) Support decision-making around buying by balancing between the control assigned to the device and that assigned to the user.

DETAILED CONCEPTUAL DESIGNS

Following the analysis of concept use in the design workshops, the authors worked with the Bristol Pound team to develop a number of paper-based designs. These designs synthesised the results from the user research and workshop, to develop conceptual designs addressing three challenges (1) faster face-to-face payments (2) being social with spending (3) supporting decision-making when buying. These are discussed in turn below, ordered according to the complexity involved in realising the designs. In our ordering we took account of the £B's current technology, the varying levels of technological adoption by the £B businesses and the additional work required by the £B team, e.g. setting up collaborations with other groups, or adopting new technologies.

The conceptual designs we present in this section were not intended as recommendations for immediate implementation, nor were they meant to represent the "best" user experience or interaction design. The designs were simply a way of visually describing and communicating to the £B team the findings from our user studies and the design workshop. We were interested in the discussions these designs could generate between the researchers and the £B team and expect subsequent designs to undergo rigorous, in-situ evaluations with users before recommending their implementation.

Faster face-to-face payments

Speeding up payments can be seen as a general trend in the industry, with a number of initiatives coming from the traditional banking sector (e.g. fastpay™) and internet services (e.g. paypal). Our findings about face-to-face spending as opportunities for rich social interactions and building community [see 20] show that this is perhaps a short-sighted way to approach payments, as they provide little opportunity for engagement between the transactors. Our design aim was therefore to preserve valuable aspects of the paper money face-to-face transaction by providing an improved connection between the digital and physical worlds with minimum disruption to the practices of the traders and customers. Supporting smoother transitions between the seams of the digital and material world and social interactions would provide less of a disconnect between customer and trader, and giving rise to more personal and richer encounters. We also aimed to speed up transactions with minimal additional technologies required with the shortest possible implementation time. This means suggesting small improvements requiring minimum effort.

Given the £B's current SMS based transactions, and the £B users' sentiments about the cumbersome Txt2Pay process, QR (Quick Response) codes were integrated into the conceptual design as a way to address speed and interactional issues, without affecting the underlying SMS payment platform used by the £B. In our solution, the QR code simply encodes data that when scanned generates a text message containing the name of payee (trader_name) and the number where the message is to be sent (figure 6 presents a working example of this implementation).

SMS

Figure 6: QR code for generating an SMS

Existing QR code generators and scanners are prevalent and easily accessible for free online (e.g. see http://www.qr-code-generator.com for a generator and QR Reader for iPhone available on iTunes[3]), meaning that both traders and customers have access to this technology. Traders can display the QR code near the point of sale so that the customer can scan the QR code as they approach to make the payment, or any place in the store where it is visible to the payee. The potential solution maps well between the differential demographics of QR code and £B users, and the much lover (in general) levels of technological adoption traders have. During the discussion it was suggested by the £B team that a URL can be encoded in the QR code that links to the £B app with all the transaction information, meaning that the user only has to confirm the transaction – the simplest form of physical interaction using a QR code based solution on a mobile device.

Being social with spending

Spending data is traditionally considered private, protected by security measures implemented by banks and the intermediaries who process payment data. However, parties with an interest in examining spending behaviour can provide incentives to users to make that data available to

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[3]https://itunes.apple.com/gb/app/qr-reader-for-iphone/id368494609?mt=8

them, for example, through the use of loyalty cards.

One route for £B users to being more social about their spending, is to create personal spending profiles that can be shared with others on a voluntary basis. Our conceptual design involves traders setting challenges and users (buyers) building a social profile of spending behaviour, through participation in these challenges. In our design, the user's spending profile is an image built up of smaller images (see figure 7 on the left). These smaller images are photos the users have taken themselves and uploaded to challenges. Figure 7 (right) illustrates the "cupcake challenge" in which a user has uploaded two photos of cupcakes they have bought.

In our design, the user interacts with the sphere by pinching and zooming to expand it, as shown by the finger movement in figure 7 (left). The result of zooming in/expanding can be represented as in figure 8, where the central sphere represents the total amount spent in a time period (in this case, 1 August to 31 August) and the connected spheres represent the breakdown of this total: with the name of the shop where the money was spent and the size of the spheres corresponding to the proportion of the total amount spent there. For example, in figure 8, of the total £B 56.45 spent in August, £B 28.50 was spent in "smallstreet".

Breakdown of spend for 1 Aug to 31 Aug:

Figure 8: A user spending profile showing a breakdown of spending

Figure 7: Challenge 1 – the buyer is challenged to buy six cupcakes in order to get the seventh free (Image of the hand: http://commons.wikimedia.org/wiki/File:Pinch_zoom.png)

This design would allow the £B team access to the spending data of their users, which the Bristol Credit Union currently controls and shares only in summary form. This would allow traders access to their customers' spending data in a way they don't currently have. This design stimulated discussions around who would share such data and whether this matches the demographics of £B users.

Supporting decision-making when buying

With our final designs we extended our focus from the £B to the wider context in which £B users do their shopping. Through this design, our aim was to encourage the £B team to think of the £B as part of a larger ecosystem of currencies and products and how their users benefit from this wider focus. Our designs, due to being blue-sky ideas, serve more as questions, than solutions to existing problems. In the first example, see figure 8 (left), our question was "How does the £B see itself in relation to other local currency organisations?" To visualise this question, the design in figure 8 (left) allows the user to scroll through various local/ alternative currencies (Bristol Pound, Bath Oliver, Timebanking, Brixton Pound and Totnes Pound) and view their exchange rates (fabricated for the purposes of the example).

Given that we were investigating the use of alternative currencies, there are issues of convenience tied to having a single device that can be used for payments in different currencies that allows a user to switch between currencies as appropriate when making purchases. While this was recognised by the £B team, their main concern lay with the different transaction costs associated with different local currencies. In our discussions around this design the £B team highlighted the need for collaborations with the teams administering other local currencies in order to realise this design.

In the second example, we ask "What if users could track the miles of the products they bought in shops?" We know from our previous user research that £B users are concerned with supporting local businesses who source local products, therefore, we have an interest in supporting users who want to monitor their purchases as a way of ensuring they buy products within a specified radius.

Figure 1, a and and b: Switching between currencies for payment (left), and Aggregate product miles (right).

To visualise this question, we presented the £B team with the design in figure 8 (right). What the figure shows is an aggregate of the product information in terms of the miles the product has travelled before reaching the buyer. This supposes that there is a facility that can access and store this distance for each product purchased, as well as a facility for the user to specify their own "radius". While the £B team agreed that users should be concerned with supporting local businesses who source local products, there emerged a different concern among the £B team regarding whether this approach to managing spending would inspire a sense of competition among £B users and a kind of showing off, which the £B team made clear they would not be supportive of.

DISCUSSION AND CONCLUSIONS

User experiences with the Bristol Pound demonstrate how its value goes beyond the currency as a mere means of payment. Besides monetary exchange, a rich set of information about people's identity, business practices, and locality are exchanged, inextricably connecting the financial transaction to its social context. Through the affordances of the physical and digital forms of the currency identities, behaviour, interactions and networks between community members are shaped and strengthened. Two issues of form and space offer inspiration for design here:

Digital as a complement to physical: Money is becoming increasingly digital and mobile [9,16] and yet our findings show the physical notes as playing a vital role in the everyday practices of the users. Both the physical and the digital forms of the currency are platforms for accessing and sharing information, however, our findings have shown how their affordances differ. The physicality of the printed notes affords a visibility that is independent of any financial transaction. Traveling with people, the currency can reach audiences outside the local area and can even be used to manipulate spending behaviour. Yet physical notes do not carry information about the transaction (who spent it, its origins and what it was exchanged for) in the way the digital form does. Designing digital infrastructure to support local economic communities should complement the physical, rather than overtake it, such that users have opportunities to extend, rather than restrict, their potential for social interaction and developing new practices of use.

Local connections over isolation: A prominent feature of the Bristol Pound is its connection with locality. Our findings suggest that the notion of "local" is interwoven with individuality, independence from central control, distinctiveness, regeneration, sustainability, diversity, neighbourliness and community: "a sense of place, heritage, belonging and well-being" [13: p17]. Unpicking notions of 'local' and its implications for design, allows us to move towards an understanding of the contexts in which technological interventions can be effective [4] and represents a marked departure from technology-centric treatments of *location* and *proximity* in the HCI literature (e.g. location-based or location-aware search [1,12]). Designing for localism requires taking account of the underlying networks and foregrounding the identities of people and place, enabling users to make more local connections, build networks and make the best use of and derive the best value from those connections without insulating community members from one another or from the wider geographical context.

As a local currency with both physical and digital forms, the Bristol Pound affords a rich set of user experiences and interactional possibilities that offer different potentialities in different settings and scenarios of use. Most notably, the form of implementation of the currency can make the invisible visible: what is normally hidden to everyday view, such as our identities and values, business models and the details of transactions themselves become manifestly observable. In doing so, their use can extend the possibilities for social connectivity and information sharing–but does so in ways that are understandable and over which users have a high degree of control.

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REFERENCES

1. Bao, J., Mokbel, M.F.; Chow, C.Y. GeoFeed: A Location Aware News Feed System, In *Proc. IEEE ICDE'12*, pp.54,65, 1-5 April (2012).
2. Buku, M.W. & Meredith, M.W. Safaricom and M-Pesa in Kenya: Financial Inclusion and Financial Integrity. Washington Jnl of Tech. & Arts, 8, 375 (2013).

3. Dix, A. & Subramanian, S. (2010) IT for Sustainable Growth. Journal of Technology Management for Growing Economies, 1(1), 35-54.

4. Dourish, P. HCI and environmental sustainability: the politics of design and the design of politics. In Proc. DIS 2010, ACM (2010), 1-10.

5. Gomez, G.M., and Helmsing, H.M.J. Selective Spatial Closure and Local Economic Development: What Do We Learn from the Argentine Local Currency Systems?

6. Hayek, F.A. (1976) Choice in currency: a way to stop inflation. Institute of economic affairs: London.

7. Helleiner, E. Think Globally, Transact Locally: Green Political Economy and the Local Currency Movement. Global Society 14, 1 (2000), 35-51.

8. Mainwaring, S., March, W., and Maurer, B. From meiwaku to tokushita!: lessons for digital money design from Japan. In Proc. CHI 2008, ACM, New York, NY, USA, 21-24 (2008).

9. Maurer, B. AFTERWORD, Journal of Cultural Economy 4,3 (2011), 349-359.

10. Morawczynski, O. Examining the Adoption, Usage and Outcomes of Mobile Money Services The Case of M-PESA in Kenya. PhD Thesis, Edinburgh Uni (2010).

11. Morawczynski, O., & Miscione, G. (2010) Trustworthy Mobile Transactions: A longitudinal study on M-PESA in Kenya. In Latusek & Gerbasi (Eds.), Trust and Technology. Hershey, PA: IGI Global, 160-173.

12. Namiot, D. & Sneps-Sneppe, M. Proximity as a service. *2nd Baltic Congress on Future Internet Communications*, pp.199,205, 25-27, April 2012.

13. Potts, R., Simms, A., and Kjell, P. Clone Town Britain. (goo.gl/FrtVUe) (2005).

14. Smithin, J. What Is Money? Routledge, NY, 2000.

15. Wang, Y., and Mainwaring, S.D. Human-Currency Interaction: learning from virtual currency use in China. In *Proc. CHI 2008*, ACM, NY, USA, 25-28 (2008).

16. World Payments Report 2012. (goo.gl/SK61bS)

17. Zelizer V.A. The Social Meaning of Money. BasicBooks NY, 1994.

18. Buxton, B. (2007) Sketching User Experiences: Getting the Design Right and the Right Design. Morgan Kaufmann.

19. Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B.B., Druin, A., Plaisant, C., Beaudouin-Lafon, M., Conversy, S. Evans, H. Hansen, H. Roussel, N. and Eiderbäck, B. Technology probes: inspiring design for and with families. In Proc. CHI 2003. ACM, New York, NY, USA, 17-24 (2003).

20. Ferreira, J., Perry, M. and Subramanian, S. Spending Time with Money: from shared values to social connectivity. Accepted, Proc. CSCW'15, ACM, New York, NY, USA (2015).

21. Gaver, B., Boucher, A., Pennington, S., and Walker, B. 2004. Cultural probes and the value of uncertainty. *interactions* 11, 5 (September 2004), 53-56.

22. Gaver, B. Dunne, T., and Pacenti, E. 1999. Design: Cultural probes. *interactions* 6, 1 (January 1999), 21-29.

23. Zimmerman, J., Forlizzi, J., and Evenson, S. 2007. Research through design as a method for interaction design research in HCI. In Proc. CHI '07. ACM, NY, USA, 493-502.