

Cheque Mates: Participatory Design of Digital Payments with Eighty Somethings

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ABSTRACT

This paper describes a project exploring the design of digital payment services in collaboration with 16 people aged over 80. Many older people find cheques valuable as a means of payment but the UK Payments Council recently proposed their abolition. We describe two designs that simultaneously aimed to preserve and augment the paper cheque as a means of making electronic payments. These were devised during participatory design workshops through critical dialogues with our eighty something participants. Workshop discussions resulted in the creation of a real world cheque system where we issued pre-paid cheques without the involvement of banks. This work informed the development of a digital cheque book based on Anoto digital pen technology. The work illustrates the value of participatory design with ‘extraordinary’ users, such as the eighty somethings, in HCI.

Author Keywords

Digital Payments, Cheques, Ageing, Participatory Design.

ACM Classification Keywords

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

General Terms

Design.

INTRODUCTION

*"You are old," said the youth, "one would hardly suppose
That your eye was as steady as ever;
Yet you balanced an eel on the end of your nose –
What made you so awfully clever?"*
(Father William, by Lewis Carroll)

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CHI '12, May 5–10, 2012, Austin, Texas, USA.

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The field of Human Computer Interaction is increasingly concerned with developing technologies for older people [cf. 11, 21]. We are well aware that our nations are ageing and that a third of the population will be over 65 within our lifetimes [24]. This is unprecedented in human history and governments around the world have invested in research to develop technologies to provide care and support. Practices such as participatory design have been adapted to focus on age. Traditionally, participants would have been recruited to a design workshop because they might be the kind of workers who would one day use the planned technology [10], or they may be consumers who might one day buy it [22]. Now participants are recruited to design workshops not because they are target workers or consumers but because they happen to be old. The risk then is that older participants in design workshops may not in a sense be true stakeholders and rather, perhaps, the unwilling recipients of new technology. But as Carroll's Father William illustrates, older people may still surprise and challenge those younger than themselves. Indeed in our work we highlight how the thinking of older participants was often ahead of that of the researchers.

This project sought to address the banking needs of the oldest old (defined as those over eighty [9] – hence eighty somethings). The project was motivated by a number of studies demonstrating that older people are not well served by the banking industry [1, 14]. One of the key findings of the early work in this project was that our participants saw the solution to their problems not in future technologies but in the past [27]. The eighty somethings we recruited were often computer literate yet deeply sceptical and critical of the technology based design ideas we wished to explore [28].

While we were conducting our workshops there was much debate in the UK concerning a proposal to abolish cheques [1,29]. Initially any invitation towards our participants to consider alternatives to cheques was fiercely rejected. This conservatism was most eloquently expressed by Rita, one of our participants. She developed a biological metaphor to argue that cheques could not be improved upon and it is worth quoting at length:

“Because human nature is always, “We can improve on what the past did.” They don’t accept that there is a limit to various forms of development. Nature does. Darwin does. On the tree of life, the ends of the branches are the dead ends where that trial didn’t work out, so you come back down the limb to the next trial. The main trunk is the ongoing development of animal life and the world. So therefore there are some times where you have reached the apex of development for that particular area. You won’t improve on it.”

Many of our participants’ agreed that as a design cheque could not be bettered. They might be expensive for the banks to process but the banks were, after all, very rich. The implication here then was strongly towards non-design [4].

We argue elsewhere that strategies of provocation were extremely useful in generating insights [28]. This was most evident with the discussion of cheques. Although the participants did not believe they should be changed in any way, over a series of workshops two prototype systems were developed because—not in spite of—their criticism of the idea of replacing cheques. This paper describes the development of these two novel paper-based payment systems and illustrates the benefits of participatory design with exceptional user groups. By making use of local communities and paper-based physical representation in electronic banking systems we highlight how it is possible to design digital banking systems that are more inclusive of older people’s needs.

THE END OF CHEQUES

Cheques are pieces of paper that can be used to authorise the transfer of money between people or organisations. An account holder completes a cheque by identifying by name the person they wish to pay, the amount they wish to pay (in words and digits) the earliest date on which the payment should be made and, finally, their signature authorising the transaction. When removed from the book a “stub” is left behind where a record can be kept showing: when the cheque was written, to whom it was written, and for how much.

Although they are uncommon in some countries cheques are still in regular use in the United Kingdom, the United States, France, New Zealand and Australia (among others) [8]. Whilst the volume of cheques processed in the UK per annum has reduced significantly in the past 10 years [8] many small businesses, charities and older people still rely on them [1,18]. Recent research suggests that 53% of people over 65 in the UK use cheques regularly (compared to 19% of those aged 18 to 24) [1].

The British cheque must adhere to certain standards in its design [7]. At the bottom it contains a code-line printed in magnetic ink that identifies the cheque number, the account number and the bank branch that the account is held at. When a cheque is handed over to a bank teller this

information is gleaned automatically from a high-speed scanner. The handwritten information on the cheque must then be typed in manually. This includes the amount to be transferred and the account into which the sum will be deposited. The latter information is typically written on a ‘deposit slip’, which is an additional document completed by the payee (the person receiving the cheque) in the bank.

Once a cheque has been handed over to a teller in a bank, it must go through a number of resource intensive stages in order for the payment to be legally completed (see [23] for a full description of process). To help explain the cheque clearing process consider Shelley and Bob. Shelley gives a cheque to Bob, who immediately pays it into the bank. The same night Bob’s bank sends the cheque physically to the bank’s clearing centre where Bob’s cheque is processed the following morning. The details of the transaction are sent electronically across a secure network to Shelley’s bank. Later that morning, Bob’s bank delivers the cheque to the exchange centre, which then passes the cheque to Shelley’s bank. The next day, Shelley’s bank assesses if she has enough money in her account, and if the cheque is signed, dated, written correctly and is genuine. If it is decided the cheque is correct, then by the end of the same day Bob starts to receive interest on the money and the transaction will appear on Shelley’s statement. After two days, Bob is able to withdraw this money. After two more days, Bob can be sure that the money will not be reclaimed without his consent (unless it is proved that he is a party to fraud).

The traditional cheque is problematic for the UK banking sector as the process described above is resource intensive [25] and vulnerable to fraud [6]. When in 2009 it was announced that cheques would be abolished within 10 years, user groups such as older people along with charities and small business were particularly concerned and opposed the plans [1]. This opposition was so vociferous that earlier this year the plans to abolish cheques were halted [26]. Despite this reprieve for cheques, one must assume that there will still be pressure to reduce their usage, perhaps by charging for their use [2]. An influential report by Age UK (the largest older peoples advocacy group in the UK) concluded that ‘significant innovation’ is required to fill the gap that cheques currently fill [1]. While cheques may not be the first payment option, many older people feel that there are many circumstances where no other payment method would do.

There is a growing sense within HCI that so called ‘low-tech’ or ‘no-tech’ solutions to problems are needlessly ignored in favour of computational innovations [4]. We have argued previously that the end of cheques is one such situation where the replacement of simple paper instruments with computational technologies will not suffice [29]. Yet at the same time these simple pieces of paper require very complex processing arrangements and are at odds with the growing emphasis on digital and electronic payments. In the work described in the following

sections, we examined with the eighty something participants how we could balance the preservation of the traditional paper cheque with better integration into the digital systems used by modern banks. In our two interventions we aimed to maintain many of the experiential qualities of the paper cheque that the eighty somethings described. Through the iteration of our designs we also introduced innovations that could make them more attractive to administer by banks or other organisations.

DESIGN APPROACH

In our design process we collaborated with 16 eighty somethings (13 female and 3 male; aged between 80 and 87). The participants were recruited from an established research panel that investigated ageing, psychology and technology use. This was a longitudinal study that had been running for 30 years. Most of the participants had now died and our sample was recruited from the survivors. All of our participants were in unusually good physical health and were well used to visiting the university and taking part in research projects. Whilst there was an usually high proportion of female participants in our workshops, we do not believe these dramatically affected the work and was representative of the differing life expectancies of women and men in the UK [9].

Each participant was paid £20 for taking part in each design workshop. In total we performed 12 workshops, although individuals only took part in two to four each. The maximum turnout at any one workshop was 6. Later workshops focused on more specific ideas and designs. These later sessions were often formed of smaller groups of between two to four participants. Over time we found it difficult to arrange suitable times so that all the participants could meet at once. Also, some participants formed friendships with each other, whilst other personalities clashed, influencing individual's choices over who they participated in a workshop with. Each workshop would last between 2 and 2.5 hours in length, and there was always a short tea break in the middle of the session where they were given tea, cake and strawberries. The sessions were known as "tea parties" and for the most part enjoyed to such an extent that the participants would often protest that they should not be paid for having fun when given £20 for taking part. The informal atmosphere of these tea parties helped the participants and the researchers get to know each other well and also perhaps allowed for the free, frank and playful criticism that characterised the sessions (see [28] for more details).

All workshops were audio recorded, and documented in part with video and photographs. In total, the workshops that informed the design and development of Cheque Mates led to the collection of 24 hours of recordings, all of which were transcribed and anonymised (all names used here are pseudonyms).

After each workshop the researchers would come together to make and compare notes and identify recurrent themes that sometimes opened up new design spaces to be explored in the following workshops. In the next section we describe the discussions from our initial design-focused workshops, which directly informed our first Cheque Mates design.

COMMUNITY CHEQUE CLEARING

Our earlier work with the eighty somethings set us the challenge of negotiating how to preserve the qualities of cheques in some way whilst also making them more amenable in an age of digital banking. Suggestions about how cheques could be in some way 'digitised' (for example, using touch-screen displays to simulate writing a payment) were quickly dismissed by the participants. The clear dislike of such ideas and the wider plans of cheque replacement led the researchers to suggest the participants could set up their own organisation that continued to process them as they were. In a discussion about how cheques might continue to exist without the support of banks it was proposed that a charity such as Age Concern might sell a pre-paid cheque book. It was suggested that the person receiving the cheque might post it to Age Concern who would then credit their account to the amount electronically via a BACS payment arranged over the telephone. There was considerable confusion about the idea but once it was more or less successfully conveyed it was still rejected:

Joan: *"I don't see that working."*

JV: *"Why's that Joan?"*

Joan: *"It seems so complicated. It's so easy just to have a bank account. You've got to have a bank account to which you have to take some money to put into this Age Concern account. It's just ..."*

Patricia: *"One more hassle."*

The notion of a pre paid cheque processed by a third party rather than the bank was returned to with other groups but was most often greeted with similar scepticism.

Janet: *I don't think that's very practical because there aren't that many Age Concern branches and if you live in the country or somewhere.*

There were frequent misunderstandings of the idea:

Patricia: *"You'd have to buy the cheques, the blank cheques before you write and send them?"*

MB: *"You're not buying the cheques. It's like a voucher you've got sort of £50 worth of cheques. Do you see what I mean?"*

Patricia: *"No."*

The participants continued to react negatively to our verbal descriptions of the idea. We did not however see these workshops as focus groups or market research but rather as

a space for dialogue between the eighty somethings and the research team [30]. Therefore we did not want to abandon an idea due to its initial unpopularity with the group. It was felt that the idea would be more easily conveyed and explored not through a verbal description but as an object. It was decided that we would make an illustrative pre-paid cheque book and, if the participants would allow, use it instead of the usual cash to pay them for taking part in the workshop.

Cheque Mates 1: Community cheques

“Cheque Mates” books were designed to be as cheque-like as possible, but two crucial differences were required. Firstly, the book was pre-paid up to the value of £20 to act as their ‘payment’ for participating in the workshop. The decision to make the book pre-paid was both a way of ensuring the participants would not spend in excess of what the project could afford as well as testing the idea of a ‘pre-paid’ cheque book that could be purchased from charitable organisations. Secondly, rather than taking the cheque into a bank branch to deposit it, the payee would have to mail the cheque to the first author (JV) who would then transfer the money to their bank account. A section was provided on the rear of the cheque for the payee to populate their bank account details (Figure 1).

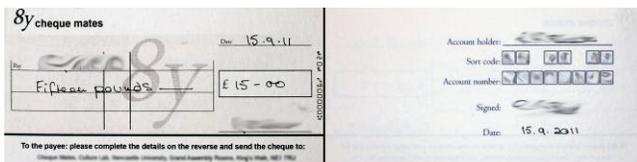


Figure 1. A Cheque Mates ‘community cheque’ front (left) and rear (right).

As the plan with the Cheque Mates books was for the participants to make actual payments to others, we took the precaution of only giving them to four of our eighty somethings. As was typical of our participants, there was initial surprise that we would be giving them something of monetary value for taking part in what they felt was ‘fun’. Although the participants had all been very sceptical, if not dismissive, of the idea when described in previous workshops they all responded enthusiastically when the book was presented to them. Agatha, while inspecting the Cheque Mates book grasped the idea immediately and summarised it like this:

Agatha: *“If I go to visit a friend and I say, you know explain what we’ve been doing and I say “Well can I write you a cheque for £20. Will you then do this.” And then she puts it in the post and she gets the £20.”*

MB: *“Yes yes yes. But what would be more interesting for us is if you would divide the money up and not just write one cheque for £20 but maybe one cheque for £2 or £5”*

Not only did the object convey the idea far more succinctly and clearly than any of the previous discussions, it was also accepted by all participants as a means of payment for their time. Of course it was explained that this was a further part of the research, which they did not have to take part in if they preferred not to. However, none of the participants refused the cheque books as payment.

The participants questioned us about who they should and should not send a cheque to. We did not want to influence them, although we doubted any high street shop would be willing to accept one. Before leaving the workshop the participants were already imagining who they would give a cheque to: *“I’m sort of thinking if I can find any business people. I mean I can think of friends that I could go and explain what I’m doing”* (Agatha).

Experiences of community cheques

Over the course of four weeks, participants used their cheques ‘in the wild’. After just one week of waiting the Cheque Mates address received the first cheque that required processing (to the sum of £2.50). As time progressed more cheques were received. The processing of each cheque comprised of JV logging into his own Internet banking account, setting up a new ‘payee’, selecting this new payee to receive funds, and then logging in once more to confirm the transfer of funds. This already lengthy process was extended further as each new payee required an automated phone call from the bank to act as confirmation. On multiple occasions JV forgot to add the postage of the cheque to the transfer (36 to 46 pence) and therefore had to go through the process again.



Figure 2. Ruth and Agatha discussing their use of the community Cheque Mates, and detail shot of Agatha’s ‘Cheque Mates’ cheque book stub.

After five weeks the participants had spent their £20. During this time the first two participants performed 9 transactions between them. When met them again we discussed each transaction with them as they were documented in their books (Figure 2). Ruth did not incur any particular problems, although she noted one friend took: *“a bit of arm twisting”*. Agatha also encountered few problems with her first two payees. Her third payee also accepted a cheque of £2.50 for a dance class. Several days

later, however, the cheque was returned to Agatha via the dance instructor's wife:

"[She] absolutely slaughtered me. I mean, they're ... friends really, I thought. But you know ... "Mike's not having anything to do with this. He wouldn't be caught by a scam like this. You've picked the wrong person here." And I said, "Hey, hang on! This isn't a scam, as I explained. It's a proper university research project." – "I don't care what it is. We have to have a written guarantee of what's going to happen to all these details. He wouldn't write all this on the back, and he's so careful when he does this, that and the other."

This was clearly quite an unpleasant experience. Despite this, Agatha saw the reaction as somewhat irrational and was bemused rather than upset: *"I mean, what could anyone do with just those bank details?"*

Other payees were happy to receive the money, no matter how small the amount. Ruth sent her last £2.75 to a local children's home completely unannounced. The children's home followed the instructions on the front of the cheque, sending the cheque with their account details on the rear to the Cheque Mates address for processing.

Whilst the participants for the most part enjoyed using Cheque Mates there were also some significant issues that would inhibit its long-term use as a payment service. Firstly, the eighty somethings found the lack of a bank name was a significant barrier to getting people to accept cheques from them—an issue we will return to in the *Discussion*. Secondly, whilst there were practical reasons we had limited the overall payments to £20, there was little doubt that such a low limit was impractical for many everyday cheque transactions – *"what about when you need a new boiler?"* Thirdly, the intermediary process was also problematic for one payee (Agatha's dance instructor), who refused to write down their bank account details and send them to an unknown addressee. Finally, the processing of the cheques in the manner described was hugely time consuming from our own perspective, and in some way reflected the banking industry's own issues with cheques. Despite these problems with the prototype system the participants were, perhaps unsurprisingly given the recent economic collapse, continued to be enthusiastic about the notion of "banking without banks".

DESIGNING DIGITAL CHEQUE MATES

The issues involved with trialling the community cheques were explored in further workshops with those eighty somethings who had used them. Before the trial of the Cheque Mates books we had demonstrated Anoto digital pens (as used in [16,17]) in a number of sessions with the eighty somethings. These pens have cameras built into them that recognise a pattern on the background of the paper, tracing the exact location of the tip on a page and what page has been written on. Although some of the participants

thought the technology was very "*clever*", they were highly sceptical about whether it might be useful for making an alternative payment system. A demonstration of the pen with a computer and data projector elicited this vociferous response from Harold:

"Forget computers. 20% of the people – you know, my generation - do not have computers. 7% have got no one who can use them for them. An awful lot [are] of an age that have got children, helpers, carers, grandkids, who use the computer on their behalf."

Other participants also criticised the technology, worrying: *"you might loose the pen"*, and asking *"why change what we have now?"*. After making the Cheque Mates prototype there followed a remarkable workshop with Agatha and Ruth. Following a discussion of the Cheque Mates prototype there was a demonstration of the Anoto pen. While playing with the pen Agatha began to articulate the ways in which it might be used to write an electronic cheque. Ruth summarised: *"So you could write something to the bank and they just pick it up the other end. Then they would have to have some way of knowing it was you wouldn't they?"* Agatha's replied *"... you could write your instructions on that piece of paper and the bank would pick it up on their screen, their computer screen. Is that what you mean?"* Their dialogue continued with increasing excitement:

Agatha: *"Yes you see if I've written a cheque or the equivalent of a cheque on that paper and I give it to the plumber for the boiler right? He gives it into his bank or he could send it direct to [...] there might be a way of sending it direct to the clearing centre and then because that's authorised on my paper then they can instruct my bank to pay his bank."*

While playing with the Anoto pen Agatha described with extraordinary lucidity how the digital cheque system the team was trying to imagine could work. The "magic paper" and the "magic pen" were imagined in a number of scenarios, such as paying a plumber for some work in their home. While speculating about how the user's identity could be authorised Agatha noted that you would have to give your own bank number and then wondered: *"Are all the magic pens the same? They don't have a number or anything on them?"* Hearing that the pens were individually identifiable led to this delighted exchange:

Agatha: *"Instead of having to remember a pin number you have it somehow....."*

Ruth: *"A pen number...!"*

Whilst both of these participants discussed the idea it was Agatha's enthusiasm that drove it forward. Ruth later described her as having a "*brainwave*" remarking *"the old brain's waved all over the place today."* Her enthusiasm had been so infectious that Ruth joked that she should be

the head of the Royal Bank of Scotland, and asked: “will you remember those of us who helped you along?”

The researchers had felt the Anoto technology would be useful in some way but had been unable to articulate this in the workshops. Here, the participants articulated the idea far more clearly than they had in a clear demonstration of the value of participatory design. Indeed, at times, the researchers felt a few steps behind the participants’ sense making. The two participants were inspired to imagine the ways in which this technology could balance innovation and conservation. In each of the scenarios that they discussed they were careful to retain what they valued of cheques. At the end of the session the team felt unsure whether what was being proposed was feasible but were inspired to explore this new design space.

Decentralising the cheque clearing process

Following our workshop with Agatha and Ruth, a period of two months was spent exploring whether Anoto technology could feasibly be used as a reliable and secure payment method. Firstly, we had to tackle the issue of transforming the written information on a cheque into digital characters. Secondly, it was necessary to identify ways in which the process could be simplified for the intermediary without necessarily ‘automatising’ the process. The human element of cheque clearing was of great importance to the eighty somethings, even if their understanding of people processing cheques was quite disconnected from actual practice [29]. In the following we describe how our technical and design work shifted from focusing on a localised ‘known’ intermediary (JV) to decentralising the cheque clearing process.

Crowd sourcing and cheque processing

In order to make a digital payment it was necessary to address the problem of converting the digitised cheque into data that could be used to initiate a bank transfer. Reliable handwriting recognition remains a difficult problem in computer science. We chose to avoid this problem and use an alternative in the form of Amazon’s Mechanical Turk [3]. Mechanical Turk is a crowd sourcing website that enables researchers to set Human Intelligence Tasks (HITs) i.e. automated tasks that necessitate human intelligence in the loop. In anticipation of privacy risks, we segmented each key field on the cheque into its constituent characters using a simple algorithm that used vertical scan-lines to locate gaps between written characters (in practice a more robust algorithm could be chosen). Essentially, the HIT comprised asking workers to tag the image with the single character it contained. This appeared more respectful of privacy than providing full payee and amount details in particular hits. For purposes of cross-validation, each image of a character was tagged by three separate workers to provide a level of error resistance.

Making the payment

The final stage of the background infrastructure was to use the data tagged by the workers to generate an electronic payment. The initial community Cheque Mates avoided this issue through our role as an intermediary. In order to action the payment we needed to use a third-party platform that could link in with most UK bank accounts. PayPal provided a useful alternative at this stage. PayPal also provides a flexible developers kit for new software to be developed, which features a sandbox where transactions can be tested and simulated [19]. See Figure 3 for a diagram of the digital cheque clearing process.

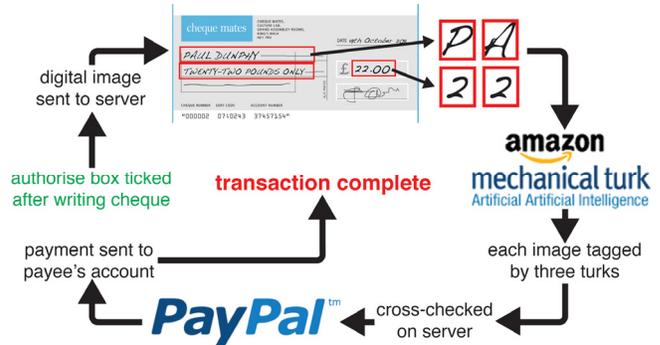


Figure 3. Digital cheque clearing process.

Cheque Mates 2: Writing with digital pens

The custom technical infrastructure explained above was used as the basis of a digital cheque, the design for which emerged directly from our work with Agatha and Ruth. Whilst Agatha and Ruth developed novel digital payment ideas with the Anoto pens, other participants were very reluctant to imagine how it could be used. A barrier was the perception that using the pens would require learning something completely ‘new’. We aimed to integrate the Anoto technology into a design that differed very little from that of a traditional cheque book.



Figure 4. Final ‘Anoto Cheque’ artwork with authorisation piget in bottom left corner.

Although we tried to keep as much to the design of a traditional cheque as possible, using the Anoto technology required some differences. The Bluetooth pens available to us did not automatically synchronise the written data to the nearby computer. This meant that we had to include a “piget” box in the design of the cheque that needed to be ticked to send the data from the pen to the computer. We experimented with the position of the piget by integrating it within the ‘signature’ but settled on placing it at the bottom of the cheque book “stub” (Figure 4).

Using the Anoto pen to authorise the payment to another makes the actual sending of the cheque to the payee redundant. Our previous work [29] highlighted how the physical sending of a cheque was an important feature in the eighty somethings experiences of cheques. We therefore suggested that the account holder might send the cheque physically through the post in the usual way. The payee would receive the cheque as a record but would not have to process it further.

Another difference that our character recognition algorithms required was that the cheque had to be written out in capital letters. We were concerned that these alterations to how cheque transactions are normally performed would be a barrier to the proposal's acceptance by the eighty somethings. We therefore included a page in the final cheque book with step by step instructions.

Our workshop participants had made it very clear that any payment system that required ownership of a computer would be a "no go". Although the initial prototypes did rely on nearby laptops we wanted to make it clear that a future device would not need the account holder to own or use a personal computer. We tackled this by packaging the pen, its charging dock, and the cheque book into a self-contained felt case (Figure 5).



Figure 5. Anoto pen, cheque book and case with integrated charging dock.

It was hoped that packaging all of the required 'technology' together would provide an increased sense that the pen would not be lost, left behind, or roll under furniture.

RESPONSES TO DIGITAL CHEQUE MATES

The responses to the digital cheque prototype were, on the whole, extremely positive. As discussed earlier, all of the workshop participants were usually vocal critics of new technology. Although their criticisms were often insightful and informative [28] the main implication was usually to abandon lines of inquiry rather than pursue them. Upon ticking the box on the digital cheque a researcher on a nearby computer confirmed receipt and told the participants the amount they had made the cheque out to and who it was

for (Figure 6). This demonstration was followed by "Wow!"s and comments like "incredible!" and "amazing".



Figure 6. Ruth writing out a Cheque Mates digital cheque.

This enthusiasm was in marked contrast to previous responses as Frances points this out here:

"I don't know all this seems so advanced and you're listening to us saying "Well we don't need this, and we don't need cheques and that." And then you come up with these brilliant ideas, just astonishes me."

The normally sceptical Patricia agreed "I think that's remarkable. I can see that, future wise." It was not the technological wizardry that impressed these participants but the fact that the prototype retained so much of what they valued in cheques:

Frances: "Well you're still writing a cheque but it's cleverly designed that it goes in."

Patricia: "I've got this as a stub to know what I've done. As opposed to electronically on a computer, which I could knock off by accident at any time, or anything. That impresses me, absolutely."

Patricia went on to note approvingly: "you don't have to send it in an envelope" adding in astonished tones: "and they then don't have to go and cash it, it's already there. I mean I'm sorry about this, but it's brilliant!" The general reception of the prototype was then overwhelmingly positive. This was particularly gratifying to the team as Frances had been the most critical member of the all of the workshop groups. She would take a visible delight in pointing out problems and reasons why ideas were impractical or flawed or "clever, but not for me". On seeing the first demonstration of the Anoto pen she had dismissed it saying it would be certain to get lost. It was astonishing for Frances to respond to the cheque book prototype with remarks like this: "We congratulate these research gentlemen on their ingenuity."

However, the session was not all congratulation. Frances and Patricia soon turned to detailed questions of implementation. Responses with other groups were also enthusiastic but there were also useful criticisms and suggestions for further iterations.

Instructions and Presentation

Initially some of the participants still treated the devices with some suspicion. Agatha started by cautiously exploring the case, pen and cheque book. As she took the pen out of the case she snapped the charging dock from the rest of the pen: "...I think I broke something." Assured that it was not broken, she continued to examine the cheque book. Finding the 'Instructions' page she read: "'Use capital letters' ... Now I wouldn't have used capital letters." As she continued to read Agatha was evidently becoming more and more baffled. She read aloud:

"When you return home, having written a cheque, and are in range of your home hub, tick the authorised transaction box. Process your payment and synchronise your payment..." Ooh dear, this sounds complicated."

It became quickly evident that the wording on the instructions page was overly complex and even intimidating. Ruth suggested: "*you need a PhD to use this!*" Although humorous the remark makes it very clear that the wording of the instructions was needlessly complicated. Suggesting that they ignore the instructions we asked them to treat it as they would a normal cheque book. Reassured, Agatha filled out the cheque to pay £19.50 of simulated money without further hesitations. Reflecting on the process she pointed out that the problem with this digital cheque was the instructions: "*When you read the instructions, it has you a bit dumbfounded, but when you get down to [it], it's quite simple to use.*"

Whilst Agatha questioned the use of block capitals, Frances had no problem with this aspect of the design: "*usually they ask for the name in printing, in block letters, so that they know who it is. And then the signature in your own writing don't they?*"

As noted before, many of the participants inspected the cheque books in great detail. This led to them quickly identifying a number of oversights and mistakes. "*There's a little mistake with this one*" remarked Ruth as she read the explanation page of the cheque book. "*You don't appear to be able to spell 'charities'.*" Geraldine noted that the paper stub left behind in the Anoto cheque book had no cheque number left on it: "*I can't see the point in doing that. Like having a stump to fill in who you've sent it to with nothing on the bottom saying cheque number three or whatever.*" These simple errors in the design of the books sometimes amplified initial suspicions. Previous work in computer security has noted that spelling, grammar and style are important factors in people judging whether an email is trustworthy or phishing [15]. In a very similar vein, these eighty somethings were judging our financial artefacts with a sharp eye on grammar and presentation.

Cost and Computers

A number of the participants were initially very cautious about the notion of replacing cheques with what they

deemed to be a complex technology. This was particularly the case with a 'new' group of eighty somethings, who had not been involved in previous workshops. They frequently referred to the cost of the devices: "*Well, what [are they] retailing them at? Can I afford to use this system, I ask myself?*"

Another significant concern was whether users would have to be computer literate. The prototype required a computer to communicate via Bluetooth with the pens. The participants made it clear that computers must not be involved in any final design: "*As long as it was a pen. As long as it wasn't a computer or something like that.*"

Confirmation and feedback

A recurring issue for many of the participants was a concern that the electronic payments would not go through successfully. On a number of occasions this manifested in the desire for feedback or confirmation that the "bank" had received the request: "*It would be helpful to have the bank acknowledge that they've received it*" (Ruth); "*Like a receipt kind of thing*" (Agatha). Several of the groups discussed between themselves what type of confirmations they could receive, such as an SMS message, or a receipt printed from a small accessory device. Agatha was less concerned with getting lots of information in her receipt: "*just something to tide you over, until you get the bank statement at the end of the month.*" Participants in the other groups were also concerned with this, especially if a digital cheque is 'declined' and: "*couldn't be honoured because you hadn't sufficient in your account. It would have to say 'No' it wouldn't pay out would it? So would it let you know?*" Frances thought that this might be solved quite simply: "*a green light if it had gone through, and a red light if it hadn't.*"

There were a number of concerns that there was very little continuous feedback from the cheques: "*What happens if you make a mistake writing with it?*" These concerns were not helped by the feedback mechanism of the pen, which would vibrate to signal both the successful sending of data and lapses in sensing the patterns on the paper (and therefore not acknowledging pen markings).

Potential Use

It is worth emphasising that not all of the participants were impressed with the digital cheques. Jack's first reaction was: "*it doesn't impress me, sorry.*" When asked why it did not impress him, he concluded: "*well, I just don't use that many cheques anyway. A book will last me 3 or 4 years.*" There were also some eighty somethings that worried it would be too complex for some of their peers. Robert disagreed: "*I love it! Great idea!*" And the majority of participants thought that the digital cheque idea was at least promising. Patricia was vocal in her praise: "*All the discussions. And all the things we've tried to talk about and what we could do, that to me has come out tops.*" During our workshops Patricia had started to use her computer

more frequently but was still hesitant to use it to do her shopping or to use Internet banking: *“now that, that I prefer to doing things on the computer as a way of electronically transferring money.”*

DISCUSSION

As the economic commentator Leo Panitch reminds us, access to financial services should be as much a public utility as access to clean water, electricity and food [20]. As it becomes increasingly accepted that access to money and banking is an assumed universal right, then it is important to ensure everybody is provided with appropriate forms of doing so. Although our study has only operated in either a very limited trial form (as in the community cheques) or to make simulated payments (as with the digital cheques) there are a number of lessons to be taken from our work in reference to the design of computational technologies for older people—both in the context of digital banking and more generally.

Communities of acceptance and accountability

A well-designed system is useless without a community that accepts its use. Whilst those that used the community cheques considered them no different to a normal cheque, some of those receiving them found them objectionable. These cheques were unusual, and had no clear indications as to what banking organisation they belonged to. As Agatha related, suspicions were roused when recipients found they had to write their bank account details on the rear of the cheque and send it to a stranger. In order for financial artefacts such as these cheques to exist, communities need to be formed that give and accept them. One idea explored with the eighty somethings was using local community centres, shops or third sector organisations (such as charities) to act as cheque clearing houses. Whilst this idea was not developed the Cheque Mates prototypes worked so long as recipients co-operated, so this idea may be revisited.

The infrastructure underpinning the digital Cheque Mates would also support this idea. As with our application of Amazon’s Mechanical Turk, typically crowd sourcing is seen to be decentralised and distributed globally. As our participants noted, however, often communities of trust in using cheques are formed through knowing who will be processing the cheque—even if this happens to be a faceless commercial bank. We imagine that rather than sending the data from the digital cheques to faceless Mechanical Turks, people working in local stores or community stores could be sent the data, to be tagged in spare moments, instead. As we have noted, the research was conducted at a time when the Payments Council had proposed the abolition of cheques. The project team are in ongoing discussions with the UK payments and banking industry, which sees potential benefit in using digital pens as a way of bridging pieces of paper with more efficient digital banking services. At the same time, our participants

were enthusiastic about “banking without banks”, and the digital Cheque Mates might bring this closer to reality.

The threat of breakdowns

In our previous work, we observed how the eighty somethings did not need any confirmation that a traditional cheque payment had gone through or not [29]. Instead they would trust that the cheque would be paid out by the bank and they could confirm this on their monthly bank statement. If there were any issues then it was taken for granted that the payee would be in touch or the bank would return the cheque. With digital cheques, however, there was a need for more immediate confirmation that the transaction had *“gone through”*. Many of the participants suggested ways of altering the design to address this issue. Not only were these proposals helpful in thinking about future iterations they also indicated that the eighty somethings really were engaged in participatory design.

It is also useful to consider what it is that provokes this difference between the perception of traditional cheques and our digital proposal. Although the digital cheques were familiar artefacts they were in equal measures unfamiliar, strange and not from their world. Whilst these were still the simple paper documents they have used for much of their lives, the significance of the actual pieces of paper was called into question. When a cheque is written with a digital pen, the paper acts as a symbol of the transaction but is no longer the transaction itself. Whereas before the piece of paper was itself the focal point of the transaction—journeying from the person who wrote it, into the hands of the payee, through to the clerk, the scanning machinery and eventually into storage—now it is a by-product of the payment process. Although it is a by-product it remains important for our participants.

CONCLUSIONS

Our work with the eighty somethings involved collaborating with them in an ongoing dialogue. As Wright and McCarthy [30] advocate, we met with them on a recurring basis and got to know more about them than what was related to the research topic. We aimed simultaneously to please and challenge them with our designs. Over time some of the participants began to suspend scepticism and imagine how digital technologies might positively alter their use of cheques. As they explored and made payments with the digital cheque prototype, it became clear that these proposals supported a somewhat playful and ludic experience [12] for our eighty somethings.

In presenting their case for implications not to design, Baumer and Silberman [4] ask HCI researchers to consider whether introducing technology does more harm than good in certain contexts of use. Providing inclusive access to finances can have a large affect on peoples’ lives—therefore, the HCI community must consider the significance of introducing new technologies beyond the appeal of novelty. The eighty somethings continually

reminded us that new technologies “cost money” and the more prudent participants observed that these new devices required charging and the printing of more expensive ‘special’ paper. At the same time, the digitisation of cheque clearing was associated with the loss of jobs and profits for the banks—even if we suggested that our designs might not even be used directly by the banks. By respecting their scepticism and insistence on the importance of the past we succeeded in creating something not only new but also of potential value.

ACKNOWLEDGEMENTS

We would like to thank our participants for their time, and Emma Jones and Lynn McInnes at Northumbria University for their support in organising the workshops. This research was performed as part of the New Approaches to Banking for the Older Old project and the Social Inclusion through the Digital Economy (SiDE) Research Hub, funded by Research Councils UK Digital Economy Theme.

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