Shades of lightweight: Supporting cross-generational communication through home messaging

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Previous work suggests that older adults view communication with family as being worthy of time and dedication, and that they fail to understand the allure of lightweight contact. This paper presents findings from a field trial in which three generations of a family were linked through situated messaging devices, which, while designed to support lightweight messaging, also afford rich and expressive contact. Analysis suggests that communication via the devices provided a valuable additional dimension to the families' existing practices, but that the type of messaging supported is best understood as one element in an amalgam of communication possibilities. Suggestions for complementary approaches are offered.

Keywords: older adults, grandparents, situated display, games, asymmetry, case study.

Introduction

The growth in internet-based and mobile technologies has the potential to help older and younger people alike keep in touch and manage their relationships, including in a cross-generational context. However, barriers to the use of such technologies by older adults seem evident; new technologies are often aesthetically designed for and marketed at younger people, they are difficult to understand when prior experience with similar interfaces is lacking, and they are often dependent upon access to an internet network in the home. In addition to factors such as these (and there are certainly more, see for example [27]), new technologies often entail a move to lightweight messaging. Texting, sending picture messages, updating one's status on Facebook or tweeting to a community via Twitter are all indicative of a shift to a mode of communication that may be frequently undertaken but that is always fleeting, dispersed over time and occurring in short, ephemeral bursts. This is a rather different style of interaction to more traditional methods of keeping in touch, such as telephoning or letter-writing, where communication is likely to be less frequent, but when it does occur, focused and prolonged.

We have previously reported that older adults express a preference for this type of focused interaction, that which might be considered 'heavyweight' [15]. Analysis of a series of focus groups with older adults revealed an outlook on interaction with loved ones as an activity that should be personal and that was considered as deserving of reflection, dedication, and skill. These qualities were appreciated in the receipt of communications, but were equally important in their crafting. This seems an issue as important as the barriers described above; older adults do not wish to undertake the types of lightweight communication afforded by new technologies, yet younger generations are increasingly adopting these very modes of keeping in touch. Bridging this gap is problematic; when our focus group participants were shown a number of lightweight messaging tools developed for the home, their reactions were overwhelmingly unenthusiastic. Perhaps the only positive comments were made in reference to a device named *HomeNote* [26], which was used to exemplify how short handwritten messages might be transmitted and displayed.

This paper presents a case study of a new situated messaging device, called *Wayve*, which was deployed in three households comprising an extended family, headed by a set of grandparents and their two sons. Wayve was designed for a family home, rather than for use by older adults, and supports lightweight messaging using various media, including pictures and scribble. The device was inspired by previous research on the use of HomeNote by families, and in its support of the transmission of handwriting it resonates with the few positive remarks made by our focus group participants. Further, by incorporating handwriting and imagery, it allows a certain richness of expression, and by affording flexible content creation, it has the potential to support reflection and focus when crafting messages. Thus, Wayve could be considered to offer a different shade of lightweight messaging, and further, one that is more personal than the broadcasting that is undertaken through tweeting and status updates. Our aim in this paper is to explore how Wayve was appropriated by this extended family, with a particular focus on examining whether the device was adopted by the grandparents and how lightweight communications across the family were valued by its different generations.

Before further detailing the design of Wayve or the ways in which it was used by the family in question, a review of the literature in this area will be presented, starting with research on connecting older adults to their families, and then considering the design of situated messaging devices for the home.

Related Work

Work in the field of HCI (Human-Computer Interaction) illustrates various possibilities for connecting older adults and their extended families. These take a number of forms, including one-way monitoring, symmetrical sharing of activity information and reciprocal game-play. Often in this research there is an emphasis on connecting places rather than people; for example, in Rowan and Mynatt's [24] deployment of the *Digital Family Portrait*, activity sensors were installed in a grandmother's home, and the information depicted in a picture frame in the home of her son. Similarly, Miyajima et al.'s [16] *FamilyPlanter* was developed to support a sense of closeness, or *tsunagari-kan*, between remote family members. Optical fibres in the planters glowed and rotated when movement was sensed at a paired plant. The use of an application requiring more explicit input is described

by Plaisant et al. [19]. In this case, shared family calendars were designed as a way of facilitating coordination and promoting symmetrical exchange of information between two sets of grandparents and their offspring, although the grandparents were found to take a stronger interest in the activities of the family than vice versa. Interestingly, a similar finding also emerged in Miyajima et al.'s study, in which older adults reported more positive feelings about the planters, and took a stronger sense of comfort from them, than younger family members.

We have previously highlighted the studies by Miyajima et al. [16] and Plaisant et al. [19] as interesting examples of the types of asymmetry that emerge in the ways that family keep in touch [14]. Indeed, it seems that older adults have sufficient time and interest to delight in information about the activities of their extended family, whether this is conveyed through ambient means, as in the FamilyPlanter, or accessed by perusing a shared calendar. This asymmetry (also recognised by Davis et al. [3]) is similarly reflected in the ways in which grandparents structure interactions by, for example, devising games for their grandchildren. A clear example of this can be found in Davis et al.'s [4] study of 'magic boxes'. These boxes were probes, simple empty boxes that were transported from one house to another by a 'magic box fairy'. Davis et al. describe how the grandparents created guessing games to direct the interaction, found items that would be suitable for play, and used the boxes to deliver home-made food. Unsurprisingly the children, in contrast, were much more egocentric in their choice of objects, including drawings of themselves and details of their own activities.

Davis et al. [4] suggest that the ways in which the magic boxes were used both illustrate the grandparent-grandchild relationship and exemplify how it is sustained: the behaviour of both parties reflects an asymmetrical relationship in which children are the focus of their grandparents' affection. Follow-up work involving the deployment of a shared display, *Collage* [28], which depicts text and pictures, has further emphasised the game-like ways in which grandparents scaffold interactions with their grandchildren. In this study, play took the form of enlarging and re-ordering photo messages and became a way for grandparents and grandchildren to connect with one another, with the game providing a recognised structure within which interaction could proceed. Other examples of game play being used as a resource for supporting cross-generational communication include

Khoo et al.'s [10] *Age Invaders*, a more physical version of Space Invaders, and Davis et al.'s [3] *Virtual Box*, which was based upon the game of hide and seek.

The asymmetry of the grandparent-grandchild relationship so clearly articulated by Davis and colleagues is not only evident in communication patterns. Based on a review of the gerontology and HCI literatures, we have previously argued that asymmetry is also reflected in the provision of care amongst family [14]. Researchers including Hoff [7] and Rook [22] have demonstrated that older adults are a source of financial, emotional and instrumental support for their families, while researchers including Krause [11] and Keyes [9] provide evidence that an inability to reciprocate in at least some of these areas may create a sense of dependency or imply incompetence. The two strands of research into communication and care show obvious parallels; older adults demonstrate willingness and also a need to care for their families for as long as they are able, and doing so has important consequences for their self-concept. Similarly, they articulate a preference for communications that require a degree of focus and intensity, enabling them to demonstrate their affection and exercise creativity and skill. Of course, there are other factors at work here too. Retired older adults are likely to have more free time available to them, and so can afford to devote more of it to contact with their loved ones.

This brings us on to the issue of designing for homes with parents and children. When designing communication appliances for the stereotypical nuclear family, the emphasis is typically on supporting the organisation of domestic life, while acknowledging the need to support playfulness and affection. Research in this space has highlighted the ways in which artefacts, such as the mail, are positioned within the home in order to be made noticeable [2], and this focus on displaying information has served as a foundation for a breadth of subsequent research into the particular attributes of situated displays. *ASTRA* [21], *On_message@home* [18], *TxtBoard* [17] and the afore-mentioned HomeNote [26] have all pointed to the benefits of person-to-place messaging. ASTRA was designed to provide a context for conversation by displaying picture messages sent to it by household members, while On_message@home was motivated as a way of providing an outlet for playfulness amongst family members. Deployments of TxtBoard and the subsequent HomeNote both emphasised how the situated display of locally scribbled notes and text messages became a means for social touch and broadcasts

of identity, as well as being used to coordinate activity. Indeed, parallels can be drawn between this work and the study of magic boxes [4]: in the same way that the work of delivering specific objects can be understood as a way of sustaining the grandparent-grandchild relationship, so too can the appropriation of messaging devices be seen as part of the emotional and practical work that underpins family life.

Motivation for this Study

While the above highlights the degree to which lightweight messages can be successfully incorporated into family life when displayed within the home, the values expressed in our focus groups with older adults suggest that this form of contact is unlikely to meet the needs of older adults when communicating with their loved ones [15]. However, the focus groups also raised issues relating to the frustration experienced by older adults in trying to keep in touch with their family members. While our participants were reluctant to use forms of communication such as text and picture messages, their families and particularly their grandchildren were increasingly adopting these. Furthermore, our findings also revealed that older adults are respectful of the amount of time available to their families, being careful not to infringe upon this, and are mindful of other people's preferences when choosing communication media (for example, some reported using email to communicate with particular family members, because this was believed to be their preferred mode). It seems then that there may be an opportunity to persuade older adults to adopt lightweight technologies on the grounds that they are more likely to connect them with their grandchildren, and because they are more suitable for the busy lifestyles of their offspring. The question remains though, would older adults find sufficient value in communicating through lightweight technologies? Or would they eventually be rejected in favour of less frequent, but richer, forms of interaction?

The deployment of a device like Wayve, which is sufficiently flexible to permit a certain level of richness, allows an interesting first step with which to address these questions. Importantly, Wayve is straightforward to use and, being designed for families, should also slot into a family home comprising grandchildren. As such, this paper focuses less on whether or not younger generations accepted the

device, and more on whether the grandparents did and how their usage was perceived by the broader family.

In the remainder of this paper, the case study and participating households will be described in more detail, before some key elements of the ways in which Wayve was used across the households are considered. To conclude, design implications will be drawn and new directions for designing to support cross-generational contact will be suggested.

Method

The study reported here was part of a wider field trial in which 24 households used a situated messaging device, Wayve (Figure 1), over a period of three months (see [13] for further details of this). The aim of the field trial was to explore how the devices would be used over time and in the context of existing social networks. This paper will focus on only one of these social networks, which encompassed three households featuring a pair of grandparents and their two sons.

Wayve

The version of Wayve used in the field trial was a first prototype of a potential product, which was inspired by previous research into other situated displays, particularly HomeNote [26] and TxtBoard [17], but also drawing parallels to technologies including *Hermes@Home* [25], ASTRA [21], *Keep In Touch* [12] and Collage [28]. Like some of these, householders can use Wayve to create scribbled messages and display them locally in the home. Further to this, Wayve can also be used to send and receive SMS, MMS and email, with each device having a unique phone number and email address. Finally, messages can be sent to other Wayves, and when received, they can be opened up, annotated or otherwise altered, and sent back to the sender or forwarded on to others.

Figure 1. Wayve *in situ* and a close up of the interface.

Messages can be created through handwriting or drawing with coloured line strokes, by entering text using an on-screen keyboard, or by taking photos using a camera in the top-right corner. As such, scribbled notes and pictures can be sent to mobile phones as picture messages or to email addresses as embedded images. Additionally, photos taken either using Wayve or received from some other source can be doodled upon and either displayed locally or messaged to others.

Wayve was designed to have an informal look and feel and to support the easy sending of messages. The address book has six 'favourite' slots to support one-click sending, allowing messages to be quickly scribbled and sent. Furthermore, the glanceability and always-on nature of the display means that messages can easily be accessed, with notes and pictures forming a scrolling display. Throughout the wider field trial, Wayve was perceived as being a very simple way of sending messages, being managed by children and adults alike.

Households

As briefly mentioned, the triad of households to be focused upon in this paper comprises an extended family of grandparents and their two sons. This family in particular were selected for analysis because they were the only social network in the field study to include grandchildren old enough to communicate with their grandparents (the other grandchild in the sample was 9 months old). Of the two sons in this extended family, one is single and lives in the same village as his parents, while the other lives with his wife and two children in a village approximately 100 miles away from his parents and brother.

The grandparents live independently in a bungalow in the North-East of England. The grandfather is both confident and competent when it comes to technology, managing the home Wi-Fi network and using a computer and mobile phone for the purposes of communication. The grandmother was described by her husband as being *"very frightened of machines"*. However, she does have some surprising comfort zones when it comes to using the computer, being happy to buy goods from eBay and to find the lyrics to half-remembered songs through Google's search engine. Despite her apparent capability, she does not use new technologies for communicating with others, and allows her husband to send emails for her:

"I'm a Luddite, I break machinery, it breaks if I look at it, I don't send emails and I don't have a mobile".

The couple's unmarried son lives near to his parents and tends to have daily contact with them. At the time of the field trial he was working night shifts, with the result that this contact was often brief and carefully coordinated, revolving around his mother doing a daily task for him, as the grandfather reports:

"[She] does his bait [food] for him, his overnight bait, and I take it round at teatime, so we have daily contact on the days he's at work".

The couple's married son lives with his wife and two children, a 13 year-old daughter and a 15 year-old son. In this family both parents are professionals and the family schedule is busy. Communication with the grandparents was reported as being quite scarce from both sides, with the son saying, *"It started off with sort of a phone call a week, then it got to a fortnight, then it got to a month, and we have tended to lose contact with what they're doing"*.

While these two households occasionally used email to supplement their telephone calls, mobile phones were not perceived as offering an alternative lightweight means for them to keep in touch. The grandfather simply did not use his mobile phone in this way: *"I don't tend to get messages from other people, I tend to get telephone calls"*.

Procedure

The three households had a Wayve each for a period of 89 days, during which time messages sent from the device were free. Each household was visited at the beginning of the trial so that Wayve could be connected to the internet and

demonstrated to the participants. Householders were then interviewed three times, initially over the telephone after two weeks and then face-to-face after six weeks and again at the end of the study. Messages sent to and from the devices were logged for the duration of the field trial.

Interviews were transcribed and the message logs examined to try to understand how the three families used Wayve and what their attitudes towards it were. A number of themes that emerged from the data will now be highlighted, including the style of messaging that the devices afforded, the sense that communication occurred within a closed network, the emergence of game play, and the display of messages as a way of drawing in the wider family. First though, some quantitative data to illustrate use of Wayve by this network will be presented.

Findings

As can be seen in Table 1, the grandparents sent more messages from their Wayve than any other household within the triad and, rather tellingly, the household of their married son received the most. The data in Table 1 also demonstrate that messages were rarely sent to or received from mobile phones or email accounts. Instead, the majority of messages were sent from one Wayve to another.

	Total messages per day		Messages to/from other Wayves		Messages to/from email accounts		Messages to/from mobile phones	
	Sent	Received	Sent	Received	Sent	Received	Sent	Received
Grand-parents	3.01	1.90	2.53	1.65	0.12	0.17	0.36	0.08
Son with family	2.19	3.05	1.78	2.40	0.37	0.55	0.04	0.11
Single son	1.36	1.67	1.08	1.31	0.19	0.25	0.09	0.11

Table 1. Average number of messages per day sent from Wayve to other devices, and received by Wayve from other devices (2 d.p.). Messages sent and received on the first day of the trial are excluded to account for initial testing and demonstrations.

These data suggest that there was a shift in communication patterns across the family network. As already noted, although the grandparents had a mobile phone, they did not often use it for texting or sending picture messages; it was a device for talking. Interestingly then, the introduction of Wayve seemed to encourage the grandparents to adopt the type of lightweight messaging that was already available to them but that they tended not to engage in. This shift was positively received by all parties, with the married son commenting on the *"great improvement"* in the volume of communication, and the grandfather reporting that he *"certainly has more contact"* with his married son and their family.

Convenience, Asynchronicity and Glanceability

At a basic level, one of the reasons for this increase in contact was reported to be the ease and convenience of sending messages via Wayve. The grandfather commented, *"The button-free side of it is good as well, you don't have to mess about with buttons, it's almost instant as you touch the screen [...] you can write something or you can go to the keyboard and just hit [son]'s Wav and it sends, you know instead of dialling and finding the number and finding the address book etc."*. Related to this though, was the perceived convenience of Wayve as a communication medium for his offspring. In a reflection of the asymmetrical nature of family relationships noted earlier, the use of asynchronous messaging made it easier for the grandparents to work around the busy schedule of one son and the unusual working patterns of the other. The grandfather reported being frequently hindered when trying to contact their married son and his family:

"They're never in the house, you phone them and it's either one of the kids, 'Oh Mam and Dad have gone out', or […] the babysitter, 'They'll be back at midnight', and er, I'll say, 'Oh I'll give them a ring at teatime tomorrow', whereas with [the Wayve], just write a message, 'Give us a yell' or something like that".

An alternative use for Wayve was to coordinate face-to-face contact between the grandparents and their single son, who reported *"using [Wayve] to sort of let my folks know when I'm sort of conscious and receptive to visitors if you like, whereas before they'd sort of knock on the door and if they didn't get any answer*

they didn't get any answer, we've been sort of coordinating things and using it that way" (see Figure 2).

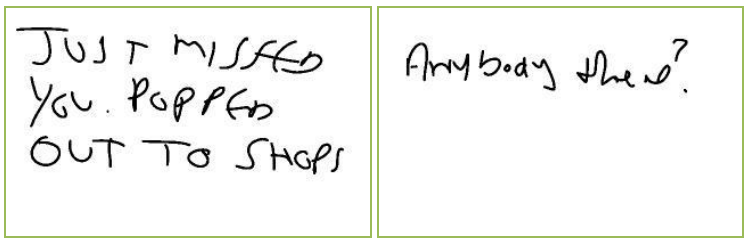

Figure 2. Two messages sent for coordination purposes.

Interestingly, Wayve also played another role in supporting face-to-face contact between the grandfather and this son, by serving as a prompt for conversation. During the field trial, the grandfather took to sending messages that required further discussion to his son's Wayve in advance of visiting him at home, as a reminder for himself when there. As already described, he called on his son on a daily basis, but only for a short period of time:

"I get five minutes with him then, then I'll come to the door [at my own home] and say, 'Oh I forgot to mention so and so', and by that time he's away to work, so that's when that machine comes into its element".

Placing content in the home of another so as to trigger conversation is an idea that mirrors a previous suggestion by Evjemo et al. [6], and seems to have emerged in this field trial because of the glanceable nature of the display. This glanceability also influenced the types of message sent by the grandfather to his married son, with Wayve frequently being used to draw attention to other messages that had been sent using some other less visible medium, such as email (see Figure 3).

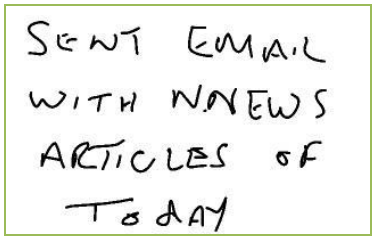

Figure 3. Message to highlight information sent using another medium.

Lighter Touches

However, the appeal of Wayve went beyond convenience and the possibility to remind oneself of something that needed to be said. The sending of lightweight messages was valued for other reasons, which were bound up with the obligations associated with communication as well as the chance to share a moment with someone. For the married son in particular, one of the main merits of Wayve was the fact that it provided a sense of connection, despite the short amount of time given to contact:

"It's not something you need to think about, it's not something you need to spend a lot of time on, if I tend to ring [my parents] or they ring me then it seems to be around half an hour or an hour's out of my schedule, which sounds awful, but you know it's that amount of time whereas with this there's not the room to do the huge long conversation or communication it's just like a little every now and again makes you feel closer somehow".

Further, this different approach to communication meant that different topics could be broached:

"It's more immediate so I think it's kind of less consequential stuff, it's more, it's more chatty stuff, I guess rather than, rather than a month's catch-up […] we'll come home and we'll say, 'Oh, it's chucking it down here', […] and then we'll take pictures of the weather and that sort of thing, where if we're communicating, if we're telephoning once a week or that sort of thing then we probably wouldn't talk about the weather, but it's nice cos I imagine if the family were in the village it might be the sort of thing you'd sort of bump into each other every other day and then talk about, but it's kind of brought us closer together not geographically but virtually together, really".

Figure 4. A picture message showing the weather and a similar message sent as a response.

As a final example that replicates previous work [26], lightweight communications were used to send social touch messages, described by the grandfather as *"just to say I'm thinking about you sort of thing"*. A reoccurring example of this was seen in a series of 'goodnight' messages (see Figure 5), sent by the grandfather and usually responded to by his married son. According to the grandfather, these messages had a practical motivation in that *"it was a case of we're not available anymore"*, but they did also have a more subtle purpose:

"With the 'night all' I was trying to keep them in, like you know, don't forget we're still here, you know sort of prompt them, which seemed to be working towards the end of it rather than the beginning".

Figure 5. Two examples of social touch messages and the replies they elicited.

Display of Images

As is evident in Figure 5, Wayve messages were often embellished with doodles and drawings (see also [13] for other examples of this), which had the effect of making messages appear *"more personal"*, but also more thoughtful, as the single son commented:

"It shows you've put a bit more thought into the message, rather than just a random, you need this information and you need it now, in a very sort of sterile environment, there's a bit more fun to it about using it".

Thus although Wayve messages are inherently lightweight, they also allow the sender to show some flair in their making. This opportunity for creativity and playfulness was also seen in the occasional sequencing of messages to craft narratives about daily events (Figure 6) and in the captioning of images (Figure 7).

Figure 6. A sequence of images illustrating a sandwich made from home-grown salad.

Figure 7. A photo featuring a caption.

This crafting of content seemed to be encouraged by the fact that Wayve messages would be displayed to multiple recipients, at an appropriate size and for a reasonable length of time. The potential for this to occur also led to the sending of photos that would not normally be shared amongst this particular family. Householders were more willing to send pictures to Wayve than to, for example, mobile phones, where they would be glanced at before being hidden away in the recipient's pocket. Examples of such images include a photo of a sunrise that was emailed by the single son, an amateur photographer, to his family's Wayves (and notably, not to their PCs), and a postcard-like image that was sent from a family holiday by the married son (Figure 8):

"I was taking pictures there using my camera phone, it was just dead easy then to send it on, whereas I wouldn't necessarily send it on to someone's phone because of the screen size".

Figure 8. Photos of a sunset and of a holiday location sent to Wayves in the family network.

This sharing of photos of unusual and exciting activities complemented the sense of propinquity associated with sharing aspects of the everyday, such as the

weather, as already described. Both the grandfather and uncle noted how the receipt of photo messages allowed them to feel more involved in the experiences of the wider family, and particularly, the teenagers:

"And the aircraft photographs, [my grandson] sent actually from the show itself, when they were busy flying over he took a picture and sent it to us, you feel as though you're more with them, whereas the telephone is a very distant thing" (grandfather);

"It certainly seems as though there's been a lot more communication with that [Wayve] than email or messenger or anything, and to me that's absolutely brilliant because I'm finding all sorts of stuff I just would never have known about, you know seeing them in a submarine on holiday or doing that when they were 30 metres underwater doing scuba diving or whatever, and I just wouldn't have seen that because we don't get together that often […] that's really bridged a gap, and of all of the things to do with the trial that's been the most pleasing" (uncle).

A final feature of the scrolling display of messages was that the whole family could be included in a conversation. The teenagers' father noted, *"I think the conversation tends to build up because the children will see the same conversation, it's more, it's a more inclusive thing whereas a mobile's a very sort of point-to-point thing, you know the children wouldn't see what I'm saying to my parents or my brother and I wouldn't see what they were saying, but it was, if it's like a to and fro thing then, then it gives a chance for all of us to chip in, so it's not the sort of thing I would do with a mobile".*

Direct Contact with Teens

The possibility of including the teenagers in the wider messaging practices of the family also allowed for the possibility of drawing them into direct communications with their uncle and grandparents. Direct contact with them was reported to have been uncommon prior to the introduction of Wayve, but was noted to have increased during the field trial:

"In terms of talking to the nephew and niece it's been sort of silly pictures to and fro about what they've been up to, and you know I'll send responses to that" (uncle);

"You know that you've got their attention, if they're doing it on that, we have talked to the kids more haven't we, I mean they're going through the growing up stage now, where they don't want to talk to grandma and grandpa, unless it's Christmas, but yes they have, I'll say so well, 'What did you do at school today', and I'll get an answer like, 'Not a lot', and that's kids isn't it" (grandfather).

However, and as alluded to in this quote, although direct contact could be established with the teenagers, the resultant conversations could be somewhat unfulfilling, and were in fact rather rare. A much more common activity was the playing of games such as 'noughts and crosses' and 'hangman', identified by the teenagers' father as being *"a great leveller"*, and described by their uncle as *"a bit of daftness, little bit of, something that was different, it was an entertainment factor rather than a communicating factor, and it got me to teach them the word stalemate"*. These games sometimes led to synchronous and focused interactions (*"probably the longest interactions have been those noughts and crosses games"*) while at other times they unfolded slowly over a series of days.

Interestingly, both the uncle and the grandparents suggested the possibility of educating the teenagers through game play. In the quote above, the uncle mentions the teaching of a new word, and the grandfather also commented, *"They love playing games and beating us, you know now and again we win, but nine times out of ten they win, with children growing up you teach them to win and you teach them to lose, so it's a bit of both"*. Additionally, there is a sense that in both cases, the adults were tailoring the interaction to the teenagers' interests. The grandfather reported, *"I did another [game of hangman] with [my grandson], and I did Leeds football club which I know he's a supporter of, and I put it such that it had to be Leeds"*, and the uncle also commented *"I think it is possible to communicate with teenagers but you've got to use the devices and the methods that they want to use, erm and you've got to adjust your approach to be one that they'd be receptive to"*. These findings reflect those previously reported by Davis et al. [4] following their study of magic boxes; the adults of the family accommodated the children so as to keep them engaged. Indeed it seems that for them the opportunity to interact was more important than the content of the interaction itself, with the grandfather noting, *"Any communication with them is enjoyable"*.

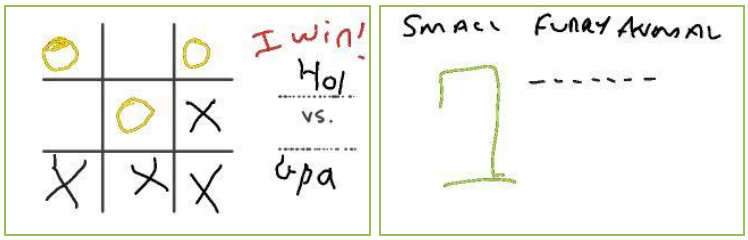

Figure 9. Examples of game-play with teenagers.

A Closed Network

One last point worth commenting upon is the fact that our participants primarily perceived their Wayves as a way of sending content to other Wayves, and not to mobile phones or email accounts (as evidenced in Table 1). The result of this was that Wayves were often considered to offer a direct connection to other family members, in a way that mobile phones or email did not:

"It's a more personal thing, I think, than the internet, and I think from the point of view, I don't know how to put it, I think from the point of view you knew the net you were in, you knew the net you were in that could receive stuff and see what you were trying to put over" (grandfather);

"I guess when you're thinking about using it as a message originator, we immediately think of sending them to the other Wayves that we know of […] It's kind of a line of communication which pipes straight through to them" (father).

Also evident though, was that not all family members were equally active within this 'net'. In particular, the grandmother and mother showed little interest in using Wayve. This goes against the view that women take the role of maintaining inter-family communications (e.g. [23]) but it does fit with the notion of technology use as gendered (e.g. [20]): in this case, women in both houses preferred to leave Wayve in the hands of their husbands. For the grandmother in particular, initial attempts to use Wayve's handwriting conversion feature were extremely off-putting:

"I wrote a message on the screen, I wanted to ask [my son] if he remembered a song called 'There was a little drummer, and he loved a cross-eyed cook', so I wrote the first verse out, in good writing, and when I pressed the button, it came

out in print, all gobbledygook, 'little' came out as 'title', and I hadn't crossed any Ts, and there's no button you can press to swear at it".

Additionally, she seemed to feel that she would need to learn new skills to use the device, including text speak, *"That's [text speak is] amusing to me, but I haven't got involved in it, if that [Wayve] was thrust at me for a long time I probably would attempt to learn that"*. But further to this, it also appeared to be the case that she wanted a stronger sense of interacting with someone than she felt Wayve could provide. Although she acknowledged that Wayve supported more frequent contact with her wider family, she pointed out that a *"phone call would last up to an hour wouldn't it"*, and also important, it would be *"live, it's the intonation of the voice, you don't need words, you can listen to the intonation, the inflection, whereas with that, it takes away some of the personality"*. However, and despite these reservations, the grandmother did have some peripheral involvement with the device: *"I look at it, I look at the pictures I look at the messages, I can change it to make it [the scrolling display] go or stop"*.

Discussion

The findings described above point to a number of implications that might be considered when designing technologies to support contact between older adults and their wider family members. Firstly, it is apparent that the grandparents in this family were willing to adopt new forms of communication media so as to fit into the schedules of their two sons. When they spoke of Wayve as being convenient to use, they seemed to be alluding to the fact that asynchronous, glanceable messages were suitable for others rather than being especially appropriate for themselves. This is an interesting departure from much of the work in this area, which aims to make technologies more accessible to older adults by making them easier to use (e.g. [5, 29]). However, it corresponds well to the notion of asymmetry in family relationships outlined earlier, and also resonates with the idea that older adults are respectful of the time available to others for keeping in touch (cf. [15]). It seems then that when designing to support cross-generational communication, it is important to *consider the busy lives of younger families, who may appreciate communication that is quick to create and send, and highly visible when received*.

Related to this, adults structured and tailored the content of their communications to suit teenagers, for example by playing games with them. Of course, this is something that underpins most social interaction; recipient design is an important feature of communication, and seeking out common ground is fundamental to conversation. However, it is interesting to see the way in which this tailoring was made evident, with grandparents and uncles making an effort to indulge younger family members, but with little evidence of the reverse. As already noted, this reflects the study of magic boxes discussed earlier [4]; here, these previous findings are extended to the case of teenagers. From both instances, an argument might be made to *allow the interests of children to be indulged and an appropriate structure created*. Interestingly, both examples also involve game play. The *levelling quality of games seems particularly useful when designing for cross-generational communication*, and perhaps this is especially the case with some children, who may not be particularly forthcoming with conversation.

The lightweight but flexible nature of Wayve messages also permitted this family to create types of communication that they were previously unaccustomed to, and to show that care had been taken in composing them. Lindley et al. [15] have discussed the importance for older adults of putting time and dedication into communicating with others, but in this previous work the emphasis was largely on using 'heavyweight' media to achieve this, such as letter-writing and telephone calls. In this study lightweight messages often incorporated a touch of creativity, as was seen in the narrative built around the making of a sandwich and the playful doodles that embellished text. The care made evident in the creation of these messages supported a sense of social touch, and the father in particular felt closer to his parents. Allowing people to *appropriate and comment upon mundane aspects of daily life* seems one way of underpinning this sense of propinquity. Furthermore, these *light social touches go some way to meeting obligations* felt by family members to communicate, and this might be particularly so for busy families. Finally, a willingness to take a creative approach to messaging was encouraged by the fact that messages would be exhibited. *Displaying messages encourages the sharing of creative efforts.*

Interestingly, the very fact that Wayve was, in this instance, restricted to a family network rather than being a more widely available product, meant that it was perceived as offering a direct link to the wider family. Obviously this would not

be the case if Wayve (in its current form) could be bought by anyone; if this were so, it might be perceived more like a mobile phone or instant messenger, allowing anyone to connect to anyone else. However, *the sense of a closed network, available only to family, was valued* here. Furthermore, the within-family mode of messaging also had the effect of prompting people to share messages and pictures that they might not in other circumstances. For example, family members sent photos from their mobiles to their own Wayves to be displayed at home. From this, it was a short and obvious step to also share these images with the rest of the family, but one which led to the grandparents and uncle feeling *closer to the action* that had unfolded.

The fact that the grandmother could see these messages was also important. Her lack of enthusiasm about using new technologies quickly surfaced, with initial problems that could have been overcome being enough to deter her from using Wayve. This may have been further reinforced further by her husband's 'ownership' of the device; its use tied in with his responsibility for turning off the Wi-Fi router at night and also his role in dealing with email (especially early in the trial when he undertook a process of testing out Wayve's email functionality). The fact that messages could be seen at a glance was perhaps the only element of the design that could draw the grandmother in and *include her in the ongoing communications* that occurred through it. This raises some interesting questions about accessibility and design; while the simplicity and immediacy of sending messages was appreciated by the grandfather, it was not sufficient for his wife. Furthermore, while encouragement from one's social network might be thought of as an important factor in technology adoption, this study illustrates how *the presence of one capable user may instead result in less certain users deferring responsibility* for the technology in question.

Findings such as these emphasise how design for universal access must go beyond design at the level of the interface. The importance of involving wider stakeholders and considering context of use has previously been noted in discussions of accessibility (e.g. [8]), and it is argued here that it is also necessary to understand how technology might be appropriated by users to fit their routines, expectations and values if it is to be made usable in practice. The grandparents, and the grandmother in particular, wished for conversation rather than asynchronous messaging; this can be seen in her comments about telephone calls

as prolonged and personal, and also in the reports of their rather unsuccessful attempts to engage the grandchildren in instant messenger-like communications via Wayve. It seems then, that they were trying to realise a mode of communication that they were familiar with, i.e. talking on the telephone, through a medium that did not really support it, i.e. a situated display. The grandmother did seem to recognise that a shift in practice might be needed for her to use Wayve, and spoke of learning text speak as a way of realising this. However, the broader underlying issue of the ways in which younger people use lightweight technologies, to post messages rather than engage in ongoing conversations, was something that simply did not seem to have occurred to her. Her focus was on the language with which the message should be composed, rather than the type of content it should transmit.

This highlights the complexities inherent in designing communication technologies to be accessible to different generations. Firstly, they may have different expectations about the ways in which these communications might unfold (posting quick asynchronous messages vs. engaging in longer synchronous interactions, for example), and secondly, they may be unaware of these differences. If this is the case, even a willingness to adapt may not result in any progressive change. Perhaps one of the key challenges in supporting accessibility in the context of cross-generational communication lies in *making both sides aware of differing expectations, and helping them to overcome these*. By *using a lightweight message to trigger a richer conversation*, for example, the communication needs of both sides might be met more fully. Similar ideas are reflected in the glanceable displays described by Evjemo et al. [6] and Romero et al. [21], in which content is used to trigger or provide a context for further conversation.

Future Directions

It is worth emphasising once again that Wayve was not designed for older adults *per se*; it is a prototype version of a more general messaging tool that in this instance happened to be deployed in the home of two older adults and their wider family. Nevertheless, Wayve was appropriated to support a sense of propinquity through the sharing of mundane aspects of family life, to fit the conflicting

schedules of the three households, and to creatively tailor messages to suit the interests of others. While the lightweight nature of Wayve messages are similar to the type of communication that was rebuffed by previous focus group participants [15], the potential for self-expression, the sharing of activities through imagery, and the closed network that was fostered in this field trial worked in combination to offer a sense of intimacy. The fact that these messages were created and crafted for the family meant that they were not considered insubstantial, despite their lightness. However, this is not to say that a richer form of lightweight messaging can serve as a replacement for other, more heavyweight, forms of contact. Considering how a combination of communication tools might be developed to suit older adults seems an important next step in supporting cross-generational contact. Before concluding, possible directions for the development of other devices that might sit within such an amalgamation will be highlighted.

Firstly, this study has emphasised once again that for some users, a reluctance to adopt novel technologies for communication can be hard to overcome. However, involving these people and permeating family roles that relate to use of technology and communication might be achieved if tools are made sufficiently simple, visible, and collaborative. The magic box [4] seems a good example of what such a technology might look like. It is possible that the transfer of scanned content (e.g. objects, photos, handwritten notes), which could be prominently displayed within a paired home, could draw in less technical older adults while supporting contact that could be personal, flexible and glanceable. Combining this with a means to easily capture and transfer digital photos would mean that support could be given to the sharing of the mundane as well as to the out-of-the-ordinary, as is reported here.

Secondly, this field trial has echoed others in underlining the ways that grandparents and also uncles try to fit the interests of younger generations, and has highlighted once again the potential for games to serve as a framework for interaction. There is a sense here that games successfully provide a purpose for interaction, which communication might unfold around, but which does not require the seeking out of something to talk about. There is surely scope here to identify other activities that might provide a similar context for interaction. For example, it was mentioned how the grandmother had a surprising fondness for eBay, an activity of potential interest to her grandchildren. Perhaps some form of

joint auctioning could be an avenue of interest for this family. More generally, helping out with homework or passing on traditional skills that are undergoing a revival (such as knitting) could be ways of establishing common ground across generations. Developing technologies so that this could be done remotely would be the main challenge here.

A final future direction is the exploration of how technology can be utilised to support richer, more dedicated interactions. We have argued previously that older adults seek to make their communications with others personal, creative and focused [15]. Telephoning and letter-writing already lend themselves to this type of interaction, and video-mediated communication is a further possibility. This field trial highlighted problems in getting hold of family members via the phone, and it seems that some of these problems are inherently overcome in video calls, which tend to be specifically scheduled in advance. Supporting such scheduling through asynchronous messaging or providing a shared space that could be used to support conversation, e.g. by dragging across photos, video clips or music files, are two possibilities for further work in this area. A final possibility relates to interaction with very young grandchildren. Due to the visual nature of video calls, young children reportedly are able to interact with grandparents over video in a way that would not be possible over the phone (e.g. [1]). Developing robust, stand-alone video devices for children might be one way of supporting these interactions.

Conclusion

This case study of lightweight messaging across three households has highlighted the values that can be found in such communication, both by older adults and by their extended family members. In particular, the glanceable and situated qualities of Wayve messages had the effect of encouraging the crafting of messages worthy of display, drawing in teenagers, and making messages visible to a grandmother wary of technology. The lightness of contact also permitted a sense of propinquity, affording the sharing of mundane aspects of the everyday as well as the playing of simple games. Finally, the flexibility of the medium meant that communications could be tailored to the interests of the young, be used to prompt further conversation, or be appropriated as a mechanism to support coordination.

Returning to the question asked at the outset of this paper, it is interesting to consider the value that the grandparents themselves took from using Wayve. They certainly found merit in the increased frequency of communication with their son's family, and in the opportunity to interact directly with their grandchildren. They also appreciated the sense of inclusion gained from being within a closed network, and from viewing photos taken at events that would normally pass them by. It is interesting to note then, that despite the protestations of previous focus group participants when discussing lightweight messaging, Wayve provided a form of contact that was sufficiently rich to hold this family's interest.

It is also true though, that the grandmother in particular retained a wish for other, richer forms of contact, the type that are difficult to fulfil through lightweight messaging alone. While lightweight messaging was recognised as a means for reaching out to grandchildren and as underpinning a sense of intimacy, it would need to be supplemented by other technologies in order to fulfil her needs. In conclusion then, devices such as Wayve must form part of a wider amalgam of technologies if they are to cater to different generations, with the value that was perceived in the lightweight messaging that it supports being supplemented by other forms of richer, fuller contact.

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