Designing a Technological Playground: A Field Study of the Emergence of Play in Household Messaging

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ABSTRACT
We present findings from a field study of Wayve, a situated messaging device for the home that incorporates handwriting and photography. Wayve was used by 24 households (some of whom were existing social networks of family and friends) over a three-month period. We consider the various types of playfulness that emerged during the study, both through the sending of Wayve messages and through the local display of photos and notes. The findings are explored in the context of the literature on play, with the aim of identifying aspects of Wayve's design, as well as the context in which it was used, that engendered playfulness. We also highlight the role of play in social relationships, before concluding with design implications.

Author Keywords
Play, games, family, friendship, communication, photography, scribble, situated display, messaging.

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

General Terms
Design, Human Factors.

INTRODUCTION

Within the field of HCI there has been a good deal of research on how friends and family communicate, yet features of play and playfulness within this communication are rarely examined in depth. Instead, the focus tends to be on what one might say are the functional benefits of such communication; keeping families aware of each others' activities for example, bringing grandparents nearer to their grandchildren for another. Such behaviours are easy to characterise and the benefits that ensue easy to identify – grandparents can articulate how much more they know about their extended family; busy working parents can declare how much easier it is to manage their lives.

CHI 2010, April 10–15, 2010, Atlanta, Georgia, USA.

Play, in contrast, is altogether much more difficult to characterise. How does one measure the benefits of playful communication for a family, or show that it deepens the bonds of friendship? Such challenges may offer one explanation as to why play and playfulness remain relatively neglected in the communications literature. Another possibility is that this neglect reflects how surprisingly difficult it is to intentionally design communication technologies to support play. After all, designing to fit operational definitions of play may mean that the resultant technologies fall foul of a fundamental irony: key properties of playfulness, such as spontaneity, exploration and surprise, may be undermined.

Yet this doesn't mean that play and playfulness in communication ought to be avoided in HCI. Nor does it mean that attempts to offer design insights for playfulness in mediated communication should be steered away from. We suggest that there are many resources and perspectives that can be drawn upon in explorations of, and endeavours to foster, play. There is an extensive literature on play in sociology and psychology, for example, and researchers in HCI have also begun to take play seriously [e.g. 1, 6, 15]. At the same time, new technologies, communicational and otherwise, are self-evidently fostering novel forms of play and playfulness, even if these behaviours are not explicit goals of the designers of such systems. Notable here are studies of mobile communications in which play emerges as a feature of interaction [e.g. 10, 11, 13, 17].

In short, it seems to us that HCI and its related disciplines would benefit from a deeper exploration of play as a feature of social interaction, or as a design concern for communication systems. Over the past year or so, we have come to this conclusion while analysing findings from an extensive field trial of a messaging device called Wayve, devised in collaboration with a start-up company. The device was primarily designed to help families manage their practical affairs, offering them what might be loosely described as person-to-place messaging functions. In conception, it derived from prior research reported in HCI, namely the Appliance Studio's *TxtBoard*, Lancaster University's *Hermes* and MSR's *HomeNote* [14, 18, 19]. Wayve offers more functionality than its predecessors, but was expected to be used in much the same way as these other devices had been. Nevertheless, we wished to substantiate these expectations through fieldwork, and so deployed Wayve in 24 households for up to three months.

Although we imagined that messaging via Wayve would foster a degree of playfulness, we did not anticipate the extent to which use of the device would be bound up with play. What we will describe in this paper is how Wayve provoked and inspired playful messaging, and further, how this playfulness performed an important role in family life. In trying to understand how Wayve engendered play, we consider the flexibility offered by the device, as well as the structure associated with both the system and the context in which it was used. First though, we will present some background to our findings and analysis, by giving an overview of arguments about play derived from the HCI and social sciences literature.

THE LITERATURE ON PLAY

Play as a concept is explored in a breadth of disciplines, yet rarely properly unpacked in HCI. Where HCI researchers do attempt this, and notable examples exist [e.g. 16], their efforts are often motivated by a particular context, such as (in the case of [16]) the design of games. In this section, we will briefly review the literature on play, attempt to identify some of its defining characteristics, and relate these to efforts to design for social interaction in particular.

Defining Characteristics of Play

As a starting point, we will consider Huizinga's [8] oft-cited sociological account of play. According to Huizinga, play is a socially cultivated mechanism, through which fundamental principles of social action are imbibed into the individual. It is said to teach members of society how to act according to rules in different social settings (and not merely playful ones), serving as a domain in which learning is undertaken without fear of negative social consequences. According to this view, play can be summarised as a "free activity standing quite consciously outside 'ordinary' life", which proceeds within its own boundaries of time and space. Its defining characteristics include that it is clearly structured, featuring elements of repetition and alternation. Indeed, the pleasure derived from play is partially understood in terms of its structure; it offers a "limited perfection" by imparting order into an imperfect world.

Such sociological 'functionalism', however, could be accused of overlooking any kind of play that is not highly structured or subject to the nexus of rules. Furthermore, the focus on rules is also at odds with current discussions of play and playfulness within HCI. For example, Gaver, Sengers and others stress openness, ambiguity and self-expression as important qualities of ludic interfaces [6, 7, 20], and while Gaver borrows the term *homo ludens* from Huizinga, he takes a rather different theoretical standpoint to him, making an argument for the need to engage with technology in more exploratory (and less rule-bound) ways. This view is partly motivated by a wish to separate the design of technologies for work, with its emphasis on efficiency and productivity, from those for play. With technologies for the latter, curiosity, surprise, wonder and reflection are the human values that are proposed as being important to promote, and designing for play is suggested as a way of achieving this.

Some of this contention can be resolved by appealing to more general notions of what we might mean by play. For example, a broader sociological perspective is offered by Caillois [2], who identifies four categories of play (competition, chance, simulation and vertigo), all of which can be experienced and engaged along a continuum from turbulence and impulsivity (paida) to the taking of delight in challenge (ludus). While Huizinga's notion of satisfaction as an inherent part of play's orderliness is reflected in ludus, Gaver's design goals seem more akin to qualities such as improvisation, which are reflected in paida. Nevertheless, in Caillois's account, both extremes are subsumed by a common view of play as having an implicit structure and underlying constraints; like Huizinga, he views play as a separate occupation from everyday life, occurring within precise limits of time and place, and engaging a restricted circle of players. He also extends Huizinga's definition to note that play is free, uncertain in outcome, and featuring a make-believe quality.

Psychologists have also tried to adopt a more all-encompassing view of play. However, it has proved a problematic concept for the field because of a tendency to assign a purpose or value to play, or to seek out incentives that might motivate it (see [5] for an early review). A notable departure from this position can be seen in the work of Csikszentmihalyi [4], who sought to explore and understand the intrinsic nature of enjoyment and pleasure, a quality that he suggests makes certain pursuits 'autotelic'. Autotelic activities are undertaken for their own sake and are in and of themselves rewarding. In his exploration of such activities, Csikszentmihalyi identifies a diverse range of pastimes, citing structured play (e.g., chess), creative expression (dancing), physical activities (rock climbing) and even work (such as surgery) amongst his examples.

Interestingly, and despite the rather different approaches adopted by Csikszentmihalyi and Caillois, there are a number of similarities in the categorisations that they put forward. Csikszentmihalyi proposes five dimensions of pleasurable activities as an outcome of his studies, two of which resonate strongly with Caillois' framework: competition; and risk and chance. Furthermore, a third dimension of problem-solving resonates with Caillois' concept of ludus, and a fourth of creativity with the improvisational quality of paida (this seems to be particularly reflected in autotelic activities with a joyous quality, such as the aforementioned dancing). Indeed, the concept of flow, suggested by Csikszentmihalyi as 'optimal' experience, resonates strongly with Huizinga's proposal that pleasure is found in orderly, repetitive and challenging activities. The only dimension that really highlights the difference in emphasis of these theorists is that of friendship and relaxation; here Csikszentmihalyi's focus on pleasure rather than play becomes evident.

It is worth highlighting that we are not the first to draw comparisons between the work of Csikszentmihalyi and Caillois. For example, the interactive artists Costello and Edmonds [3] have proposed a framework of 13 pleasures of play; a synthesis of the ideas of six theorists including these two and four other philosophers, psychologists and game designers. The framework serves to widen definitions of play further, incorporating activities such as exploration, captivation, sensation (pleasure from physical actions), sympathy (sharing emotional or physical feelings with something), simulation (representing something from real life), fantasy (perceiving fantastical representations), camaraderie, and subversion (the pleasure of rule-breaking).

The breadth of this discussion emphasises how play is made manifest across the gamut of activities that constitute everyday life. Yet despite this, in most accounts it is understood as separate from the world, and thus somehow protected from it. A common theme running through the literature that we have described is that play unfolds under the auspices of a set of constraints that allow players freedom to experiment; following Salen and Zimmerman [16] we might express this as "free movement within a more rigid structure". Thus, while we might disagree about the extent to which play is rule-bound, we are free to experiment and express ourselves within the world of play in ways that we might not be so inclined otherwise. Likewise to be playful, or to engage in playfulness, means that there are elements of this freedom in what we do.

Play as a Feature of Social Relationships

However, and despite its broad focus, there is something missing in much of the above: to this point, very little has been said about the role of play in social relationships. For example, while Huizinga's arguments tend to frame play within the context of social rituals, he says little about how play might vary across different kinds of relationships, or how it may cement already existing ones. Similarly, while Caillois notes that play often occurs within a restricted circle, he says little regarding whom this circle might comprise or how play might consolidate it. Psychological approaches too, with their focus on the individual, have little to say here; while Csikszentmihalyi touches on the social element, he does not examine how playfulness might be a fundamental part of people's relationships.

Yet, when we turn to the HCI literature, it becomes quite clear that play is an important feature of social relationships. Salen and Zimmerman [16] suggest that games are valued as social experiences, and that the social aspects of play are one way in which play becomes meaningful. Voida and Greenberg [22] also demonstrate how console games can serve as a means through which people spend time together. In studies of communication too, play has been found to be expressive of, and expressed within, the context of existing relationships. For example, in an exploration of asynchronous and local messaging practices within the home, Perry and Rachovides [15] show how personalised and colourful materials were used in conjunction with scribble and pictures as a way of expressing playfulness. Furthermore, word play, jokes, creativity, and poking fun were a mechanism for displaying care and demonstrating affection amongst family.

Similar kinds of playful behaviour have been reported in papers exploring mediated communication with situated messaging devices. For instance, a study of the *Collage* system [21], which enabled users to send pictures from their mobile phones to screens shared across three extended family households, has highlighted the emergence of storytelling and play activities in interaction. A field trial of the aforementioned *HomeNote* [19] also showed how elements of playfulness and play were mingled amongst more practical messaging practices. Finally, Voida and Mynatt [23] provide examples in which photos were used to trick, tease and playfully tantalise others in a study of an instant messenger that supported the sharing of images.

Moving from situated to mobile devices, studies of MMS messaging have demonstrated how images are used to support joking, express emotion and affection, create art and tell stories [e.g. 9, 13]. Kurvinen [11] comments on the use of pictures for teasing and joking during the course of MMS conversational threads, and Salovaara [17] describes how friends appropriated a bespoke application to playfully create MMS comic strips. Kindberg et al. [10] also point to a range of ways in which MMS is used playfully, including through riddles and turn-taking in spontaneous games. In their view, playfulness helps celebrate the moments that people have with one another.

In the work described above, it is clear that play is closely linked to social interaction and is expressed within the context of existing relationships. However, play is rarely the focus of the fieldwork or the analysis, often being addressed as a side issue. Similarly, while HCI has considered elements of playfulness as part of the wider shift to designing engaging experiences [e.g. 1], the focus tends to be on fun rather than on play itself. It seems that, within HCI, play as a topic is most closely considered in game design, where the main emphasis is not on relationships.

In this paper, we address this under-reported area, asking how playfulness is made manifest in social interaction, and further, why particular technologies might enable or encourage the emergence of such behaviours. We hope to go beyond simply describing playful practices, aiming to unpack the properties of what was observed and relate the findings back to the characteristics of play detailed above. In particular, we wish to use the idea of play as free movement within a more rigid structure [cf. 16] as our starting point. In this exploration of the playful uses of Wayve, we will consider firstly, what form this free movement takes, secondly, the nature of the structure, and finally, what role the emergent playfulness takes in social relationships. We will now turn to the task of reporting our field study, beginning with a description of Wayve itself.

THE 'WAYVE' MESSAGING DEVICE

Before we describe Wayve, we should note that our primary intention in this work was not, initially, the study of playfulness in messaging. At the outset, our main goal was to explore how this new messaging device might be used by families and friends over an extended period of time, whatever that use might be. Though we planned that this would be in the context of existing social networks, we did not predict that the device would be so conspicuously used to bring fun to family connections or the weave of friendship.

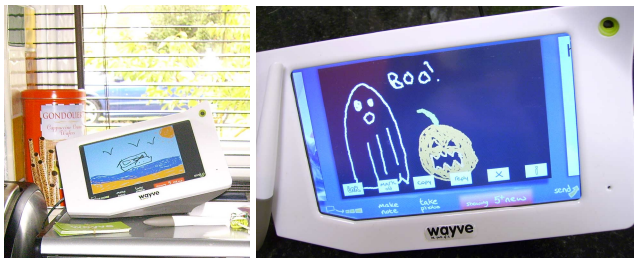

Figure 1. Wayve in a participant's kitchen and close up.

Wayve, shown in Figure 1, is designed to be a new kind of information appliance, which connects wirelessly to the internet (although it has a power cord). It is intended to have an informal look and feel, sitting at a quirky angle on a table or kitchen counter, with a magnetic stylus swinging from its left side. The device itself was a first prototype of a potential product, inspired by other situated displays which had been built for the purpose of research, as already mentioned [14, 18, 19]. Like these, Wayve could be used to create and locally display scribbled messages for other household members and could receive SMS messages from mobile phones. However, the functionality of Wayve also extends that of these initial research prototypes: Wayves have unique phone numbers and email addresses, and so can send and receive many different kinds of content to and from mobile phones, email, and other Wayve devices.

More specifically, messages can be sent from Wayve using SMS, MMS and email channels. They can be created through handwriting and drawing comprised of coloured line strokes, text created using an on-screen keyboard, photos taken using a camera (located in the top right-hand corner; see Figure 1), or any combination of these. Thus, scribbled notes and photos can be sent as picture messages to mobile phones, as embedded images within emails, or they can be messaged to other Wayves. The interface itself was designed to make sending both quick and easy, with the inclusion of six 'favourite' slots in the address book to support one-click sending. Indeed, in various internal trials, we found that Wayve was widely perceived as being a very simple way of sending messages, a fact further borne out in the field trial. Messages received by (or created locally using) Wayve are not hidden away but persist on the device until dealt with, circulating slowly with other new messages that might demand attention. These can be doodled upon, and altered versions can be displayed locally, sent back to their creator, or forwarded on to others.

THE FIELD TRIAL

A total of 24 households were involved in the field trial. Sixteen of these formed small networks of family and friends, while eight were 'lone' families, who knew none of the other participants and therefore used Wayve in relative isolation. The networks comprised a quartet of households in which the mothers were friends, two trios of households who were extended families comprising a set of grandparents, and three pairs of households, two headed by siblings and the third featuring a strong friendship. The ages of the children ranged from 9 months to 19 years. Households were loaned a Wayve for an average period of 83.3 days; the maximum duration being 99, and the minimum being 54. Messages sent from the device were free for the duration of the trial.

Each household was visited at the beginning of the trial so that Wayve could be connected to the internet and demonstrated to the participating family. The households were then interviewed three times: by telephone after two weeks, face-to-face after six weeks and again at the end of the trial. The interviews were recorded and messages sent to and from the Wayves were logged. A selection of messages was chosen to prompt discussion in the final interview.

The message logs were analysed to understand the different ways in which playfulness was expressed and the ratio of playful to non-playful messaging. Descriptions of these analyses are given in the sections that follow. In addition to examining the message logs, the interview transcripts were inspected to gain an understanding of the participants' motivations for sending messages and their reactions to receiving them. This analysis focused on using interview data to enrich our understanding of the logs as well as to gain an insight into the wider experience of using Wayve.

OVERALL STATISTICS OF USE

Inspection of the message logs reveals that, in total, 5143 messages were sent *from* Wayves during the field trial, and 3951 messages were sent *to* them. Both figures exclude messaging on each household's first day to control for initial testing and demonstrations. Novelty effects were apparent but usage was sustained throughout: in week 1, an average of 36.13 messages was sent per household; in week 4 this figure was 16.83 and in week 8 it had risen to 22.46. Even in week 12, when the sample was depleted (and there were fewer other Wayves for households in networks to send messages to), an average of 12.87 messages was sent per household. A graph of the average number of messages sent and received per day across the whole trial period is given in Figure 2. These data are separated according to whether households used Wayve in the context of existing social networks based on friendship or family (and therefore had the option of sending to other Wayves), or were 'lone', and knew no other participating households.

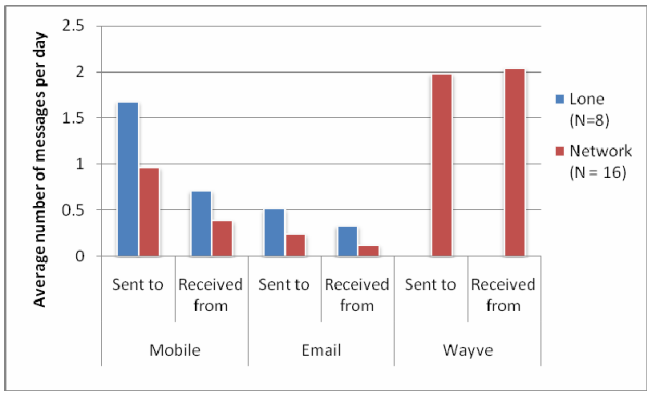

Figure 2. Graph to show the average number of messages sent/received per household per day through different media.

As can be seen in Figure 2, for households who were networked via Wayve with friends or family, Wayve messages were most commonly sent to and received from other Wayves as opposed to mobile phones or email accounts. For lone households, the principal use was sending content from Wayve devices to mobile phones. While the types of messaging we observed reflected many properties of previous work on situated devices [e.g. 19], it was also evident that Wayve afforded the crafting of messages that were particularly rich, expressive and playful. We suggest that this richness is one of the reasons why Wayve was predominantly used as a device for creating rather than receiving content, and for Wayve-to-Wayve messaging, where recipients could reply in kind.

Before we put forward these suggestions though, it is important to give an impression of just what proportion of Wayve messages were playful in character. To this end, a sample of 300 messages sent from Wayves (to any other device) was randomly selected and categorised as playful, non-playful, or ambiguous (in that the coder could not determine whether the message was playful or not). The sample consisted of a randomly selected chunk of 30 messages taken from the logs of 10 of the households, ignoring messages received and discounting duplicate messages sent to multiple recipients. The households were selected randomly, with the constraint that none were in the same network. Of the 300 messages that were analysed, 119 were categorised as playful, 138 as non-playful and 43 as ambiguous. A selection of 60 messages taken from 6 of these households was also coded by a second rater, who was not involved in the project, to evaluate the reliability of the coding scheme. Cohen's κ was calculated as .74 (.81 observed as a proportion of the maximum possible), indicating a substantial level of agreement. Two examples of messages coded as non-playful are given in Figure 3.

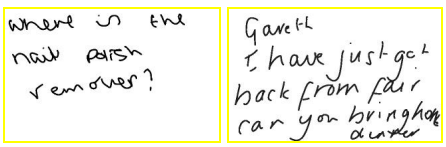

Figure 3. Messages coded as non-playful.

FORMS OF PLAY WITH WAYVE

In this section of the paper we will explore different types of play that emerged with, around, and through Wayve. The findings presented here are derived from all messages, the interview findings, and our observations of what was displayed on Wayve when we visited the households. Note that the descriptions that follow are not meant to be an exhaustive nor mutually exclusive taxonomy. Rather, the categories presented are intended to highlight the diverse ways in which playfulness was made manifest, and played a role, in the uses that Wayve was put to.

To derive these categories, the entire log for each household was inspected for messages that appeared playful. These were then sorted into clusters of messages that had been identified as playful for similar reasons (for example, all instances of competitive games were grouped together). Groupings were bottom-up, emerging from the data and independently of the various schemas highlighted in the literature review. Categories were then broadened out to connect households within the same networks, before an overarching scheme was devised that incorporated the types of playfulness seen across all participating households. We ended up with four major categories:

- Playfulness in Messaging: the richest category, where messages took playful forms in a variety of ways;
- Play via Wayve: where Wayve acted as the conduit through which structured games were played;
- Play around Wayve: where Wayve became a part of collocated play;
- Play with Wayve: where the device itself inspired creative activity.

The first two categories relate to the sending of content, with the expression of playfulness occurring in the context of a dialogic relationship across devices. Unsurprisingly then, they were much less common amongst lone households, although playful messages were also sent from Wayves to mobile phones and email addresses, and vice versa. The latter two categories relate to local display, with the sending of content being an afterthought, or a way of archiving content. These behaviours were more commonly seen in households with young children, although they were not exclusive to them. Each of the four categories will now be detailed in turn.

Playfulness in Messaging

Wayve was introduced to the households as a messaging device, and although it also served as a local picture display, most households perceived the leaving and sending of messages to be its main use (when asked to describe Wayve, *"a touch-screen message board"* is an example of a typical response). Playfulness was evident in messaging practices, although it was realised in different ways across the different households. For example, while some participants seemed to delight in captioning photos, others incorporated playful elements into more mundane messages. These different forms will now be described.

Playful Embellishments

One of the simplest examples of playful messaging was the incorporation of drawings or scribbles to embellish text (Figure 4). This was particularly common on occasions such as birthdays, but by no means limited to them.

Figure 4. Messages featuring playful embellishments.

In most cases, embellishments served to add a sense that the message marked an exciting event or was special. Social touch messages [cf. 19] were readily apparent in this category, but even simple reminders could also be embellished. In other instances, the embellishment of messages took a more interactional form. The images shown in Figure 5, for example, reveal part of a playful sequence of turns, depicting a make-believe conversation between two dogs. The interaction serves in place of an apology, with both parties indulging in the façade.

Figure 5. An apology: 'Sorry for biting you poor Pippa'.

Poking Fun

Wayve was also used as a way of playfully provoking family and friends. For younger children, Wayve provided a new means by which they could be cheeky, enabling them to publicly insult or mock their siblings (Figure 6 left). In a variant of this, one of the youngest girls in the study also took to inundating her sister with messages, sending several drawings and scribbles to her email account, despite her apparent annoyance (Figure 6, centre).

Figure 6. Messages that poke fun or tease others.

For adults too, Wayve was used to poke fun; for example, one wife used it to point out a new beard on a photo, accompanied by the tagline, 'nice eh!'. Often though, teasing was more subtle than this; for instance, a photo of some chilli plants, captioned 'Chillis coming on well', was sent as a way of pointing out that they were rather healthier than the recipient's tomato plants. As a final example, the image on the right of Figure 6 shows a head that is actually the only remaining piece of this toy, its body having been chewed up by the family dog. By sending a picture of an ongoing annoyance, accompanied by the word 'smile', the sender is adopting a slightly provocative method to try to cheer up his (grumpy) partner.

Self-Deprecation

Wayve images were also used as a means to poke fun at oneself. Often this seemed to be a playful way of creating common ground; for example, one of the participants sent a friend a photo of herself while suffering a hangover, with the tagline 'very rough eh'. This was done in the context of an expectation that her friend would be in a similar state, following a series of Wayve messages sent the previous night regarding their appreciation of a particular alcoholic drink (Baileys). In the same way that poking fun at others was not always obvious, some of the participants were rather more subtle in their self-deprecation. A photo taken by a father at a hurdy-gurdy festival provides one example of this; here, the palpable reason for sending the message, accompanied by the text 'Just arrived!', was to confirm that a stressful journey had been completed. Lying beneath this however, was an acknowledgement that his family was much happier that he was playing his hurdy-gurdy somewhere other than in the family home:

"They don't really like my hurdy-gurdy because it's quite noisy and it's a drone instrument so you've got this sort of [groan] in the background when you play the notes, so it was partly to say look at me I'm really enthusiastic about hurdy-gurdies, and there's lots of them here, and partly to make them pleased that they were [at home] and not where I was".

Displaying Wit

Finally, Wayve messages were often crafted as a means of simply being witty, demonstrating humour and displaying creativity. Such messages sometimes involved inventive approaches to the taking of photos (Figure 7 left), but more frequently they featured some combination of photography and scribble. The captioning of photos or augmenting of them with 'graffiti' was a common way in which wit was displayed, with householders often responding to photo messages from others by scribbling on them and sending them back (Figure 7 centre and right).

Figure 7. Photos that are inventive and annotated with captions ('I wish I could see') and graffiti.

This type of behaviour shows some overlap with the creativity described later, in the category 'Playing with Wayve'. However, here creativity unfolds in a dialogical context, with householders receiving images and altering them by way of reply, as described by this father:

"They spend hours sitting there, drawing over messages and photos and sending them off and then getting it back and changing it".

Other examples falling into this category include messages that find playful ways to ask others questions (Figure 8 left

and centre), or to cleverly draw them into an interaction. The latter was particularly evident in guessing games, an example of which is shown in Figure 8 (right).

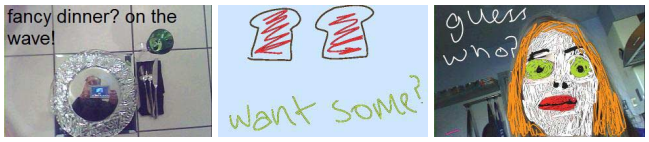

Figure 8. Imagery used in asking questions (left and centre; left is a table set for dinner) and a guessing game (right).

Play via Wayve

While the messages discussed so far point to pleasures associated with imagination and humour, play that reflects other qualities, such as competition and skill, was also evident in the message logs. This was most obvious when participants engaged in well-known games via Wayve, a behaviour that emerged gradually over the course of the field trial, and was adopted keenly by some households.

Competitive Games

The message logs showed that games such as 'noughts and crosses' and 'hangman' (Figure 9) became a prominent feature of Wayve usage for some family networks. Games were sometimes played slowly, with turns unfolding across several days, or in other cases undertaken as short sharp bursts of activity. This type of engagement seemed to be undertaken for fun rather than serious contest; indeed, for some players, it did not really matter who was at the other end, and in extreme examples, even cheating was forgiven (for example, one household took to wiping out their opponent's previous move in noughts and crosses, allowing them to take the occasional additional turn).

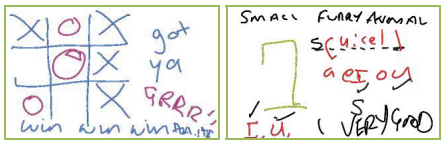

Figure 9. Examples of competitive games.

This type of interaction was noted by some families as supporting contact between people who might otherwise rarely communicate. This was perhaps most notable for a set of grandparents and their teenage grandchildren, who seldom spoke on the phone, but who regularly played via Wayve. Here, the common ground provided by the games was seen as particularly valuable (see also [12]).

Scribble Play

A contrasting type of play that emerged might be termed scribble play. This also featured a strong turn-taking element but did not incorporate explicit rules; here, play was a feature of an ongoing period of mutual engagement. This type of play was most obvious in messages sent between two young cousins (aged 6 and 7), who took turns to scribble to one another. Despite the lack of rules, implicit norms were evident, as is seen in the final message of Figure 10, which prompts the recipient to reciprocate.

Figure 10. A sequence of notes sent during scribble play: 'your crazy cool!' – 'yes I am ☺' – 'your turn to scribble'.

Playing around Wayve

In contrast to the playfulness that was revealed to be an inherent part of messages sent from Wayve, the device was also used as a resource during episodes of collocated play within the home. This was most readily apparent in use of the camera to take funny photos, a behaviour often adopted by children, but also seen amongst adults at events such as barbeques and parties. Photos were also taken of incidents that simply happened to unfold in the vicinity of Wayve, such as cake-baking in the kitchen. Often, these photos were embellished with drawings, creating new imagined possibilities out of the results (Figure 11).

Figure 11. Examples of play around Wayve.

Pictures like this were rarely sent, other than as a means of being archived on computers or phones. Instead, they seemed to be a way of celebrating the moment (see also [10]). However, they were sometimes left to be discovered by other family members, as was the case with the central image in Figure 11. As the boy's mother describes:

"When my son's here and his friends are round in the evening you get up in the morning and there's all funny pictures left on there".

Playing with Wayve

Finally, Wayve served as an outlet for more solitary forms of creativity. Again, this was most frequently undertaken by children, but some mothers in particular also engaged in the production of pictures and portraits, ranging from the juvenile to the artistic. These images sometimes formed sets, with examples including a collection of caricatures, one for each family member, and a series of sketches of the family cats (Figure 12, left).

Figure 12. Drawings and a photo displayed on Wayve.

Photos that were emailed to Wayve from personal computers also served as an inspiration for this type of creativity (as already indicated, this behaviour is differentiated from the 'Displaying Wit' category, because

these photos did not form part of an interaction involving multiple parties). However, while these drawings and photos were not created to be sent to others, it was still important for them to be seen. Indeed, the display of drawings and caricatures of family members speaks to the ways in which Wayve became an outlet for family identity to be broadcast, in a manner akin to that seen in [19].

DISCUSSION

In the closing stages of the literature review a number of characteristics of play were identified that allow us to consider why use of Wayve took the forms we have described. We suggested the need to explore both "free movement" and the "rigid structure" within which play emerges in trying to understand why Wayve lent itself so readily to playfulness. We therefore need to consider in what ways use of Wayve can be understood as occurring within its own sphere, as occupying a bounded time and place, and as engaging a restricted circle. A second issue we raised has to do with how little has been said about the role of play in social relationships. The field study highlighted the various ways in which play was a means of connecting people, as well as a celebration of being together. In what follows, we discuss these two issues.

Qualities of Wayve that Engendered Play

Much of the above demonstrates qualities that theorists have pointed to as important dimensions of play, including creativity, competition, camaraderie, exploration and fantasy. All of this speaks to the ways in which Wayve was freely and inventively appropriated by householders. In considering why this was so, we can speculate as to which aspects of Wayve's design made it particularly suited to the creation of playful as against serious content, and to what extent both the freedom offered up, as well as the structure imposed (either by the device or the context in which it was used), may have fostered this.

First of all, the particular combination of pen-based input, photos and the instant accessibility of the Wayve interface provided an opportunity for freedom and flexibility of expression not usually seen in most messaging devices, and certainly not available to our participants. All of this was offered, at the minimum, by simply picking up the pen and doodling. Added to this, the combination of photography and scribble supported easy captioning and graffiti, something which cannot so readily be accomplished through MMS messaging or email. This in essence offered up a playground for unfettered, rich forms of expression.

Secondly, we can see that certain aspects of Wayve's design did, inevitably, constrain the uses to which it might be put. For example, the nine-colour palette and broad pen were somewhat limiting, as was the 15 cm x 9 cm screen. Ironically though, the combination of these features seemed to disinhibit some participants; family members who did not consider themselves artistic and would not, for example, sketch on paper, enjoyed drawing and doodling on Wayve. Building on this point, we might also speculate that these features made Wayve less suitable for more formal acts of productivity. The screen size was ideal for scribbling short notes and displaying photos, but less so for writing longer messages. Indeed, participants felt that the device was unsuited to more decorous types of communication and tended not to use it for such purposes.

Another relevant design feature is the camera's viewfinder, displayed on the screen where it can support theatrical posing, but insufficient for more earnest or artistic photography. In fact, the constraints of the camera were often cause for complaint amongst the participants, who bemoaned its lack of flexibility. Nevertheless, it became integral to the creation of funny and staged photos, and it might be argued that the inventive images that were captured through it are considered playful precisely because they overcame the camera's constraints.

The third aspect of design we want to address has to do with the boundedness of Wayve. The feature-oriented view of the constraints offered by the device, presented above, gives some indication as to why it was associated with play and not with work. However, this argument can be extended further to encompass Wayve's contextual boundaries. Because it was more suited to playful activities, the device occupied a separate sphere of activity to that of work and productivity. Wayve was used almost exclusively to contact friends and family in the field trial, unlike mobile phones and email, which are often used to also reach work colleagues and therefore breach these boundaries. The fact that Wayve was situated in the home also meant that the content displayed on it was open to those permitted access to that space, namely family and friends. Finally, the status of Wayve as a device for the home ensured that messages sent to it were encountered in a location that is disassociated with work (at least ideally).

The above resonates with the idea of the restricted circle highlighted in the literature review. However, we also saw how the possibility of messages being seen by several members of this restricted circle was an additional motivating factor. Householders reported that it was worth sending playful content to Wayve because it would be seen by multiple recipients, potentially drawing in all the family, and further, because it would be continually on show. Indeed, some participants commented that they would not have bothered to send their messages to a mobile phone, where they would be glanced at and then hidden away. For them, their wit, creativity and skill had to be shown off; it had to be seen. Finally, the drawing in of multiple parties also supported collocated play around the device, which is likely to have further reinforced its association with play.

This leaves a final characteristic of play to be discussed; its orderly and rule-bound nature. While little of the play that materialised in this study had explicit rules, much of the behaviour observed was underscored by the orderly characteristics of play that Huizinga describes: playful

communications were often structured; they alternated between participants, and they incorporated elements of repetition. This can be seen, for example, in instances of scribble play and in the development of conventions surrounding captioning or embellishing messages; the turn-taking that is instrumental to social interaction easily evolved into playful mimicry. Indeed, households who were participating within networks primarily used Wayve only to reach others who also had a Wayve (explaining the strong element of Wayve-to-Wayve messaging highlighted in Figure 2); it was reported that people without Wayves did not have the means with which to properly reciprocate.

The above discussion is an example of how playfulness can be understood as freedom of expression that is nevertheless fostered by the imposition of both functional and implicit constraints. On the surface, this contrasts with suggestions [e.g. 7] that ludic engagement is supported through designs that are ambiguous and promote surprise, wonder and reflection. However, while Gaver and colleagues move away from the incorporation of rules as central to the kind of play that they wish to design for, the present study offers support for the view that constraints and boundaries provide a framework within which playful activities can emerge. In fact, it is worth emphasising that constraints not only create a risk-free environment, but also act as a barrier which, if overcome, actually affords experiences of surprise and wonder. Salen and Zimmerman [16] note that play exists because of, but also in opposition to, more rigid structures; new forms of expression are recognised as being new precisely because they usurp existing boundaries.

Play as a Fundamental Feature of Social Relationships

The final issue we wish to address in this paper is the role of playfulness in social relationships. We have seen how Wayve made visible playful behaviours which, presumably, were already an important part of family life. Indeed, many of our findings resonate with those reported by Perry and Rachovides [15], who focused on materials such as sticky notes and blackboards for activities such as poking fun. They suggest that playfulness is one way of making a home what it is, and note the importance of creatively crafting messages as part of this 'work'.

Notably, for behaviours such as poking fun to be successfully realised, communication media must allow for a degree of subtlety. With Wayve, householders were able to mock one another precisely because the medium allowed them to do so without the effect being too blunt; teasing remained affectionate, a way of demonstrating and reinforcing bonds, without being insulting. Indeed, part of this resonates with Huizinga's argument that play is a way of testing boundaries without fear of negative social consequences: insults are not to be taken seriously in the world of play. We also saw how Wayve messaging engendered ways of dealing with slightly awkward situations, such as delivering apologies; Figure 5 clearly illustrates how humour is brought to bear in such situations.

Finally, we have seen in this study how play via Wayve was important in providing a language through which family members who would not normally communicate could interact. In using the device as a medium through which games could be played, grandparents and their teenage grandchildren found a common ground. The scribble play indulged in by the young cousins was also described by their parents as a good way of levelling a small age difference between the two girls: although only one year apart at school, the younger of the two found it difficult to communicate using Instant Messenger and other tools at which her older counterpart was said to be adept. Wayve became an avenue through which the younger girl could engage her cousin. Indeed, much of the playfulness we have seen can be understood as creative ways of reaching out to friends and family, both through messaging and through the display of images and notes within the home. Wayve became a legitimate means of drawing attention to oneself, in a way that can be understood as 'broadcasting identity' [cf. 19], both of oneself and of the family as a whole.

CONCLUSION: DESIGN FOR PLAY

The preceding discussion has pointed to a number of aspects of Wayve that made it inherently suitable for the creation and display of playful messages and for indulging in play itself. These will now briefly be highlighted in order to draw a number of design implications for the creation of messaging technologies to support these activities.

First of all, such technologies need to *allow activities to unfold in a separate sphere*. For a play world to be created and sustained it needs to be separate from the world of work and productivity. This separation is defined by time, place, and the existence of a restricted circle of players. If a separate sphere is successfully created, the very use of the device may become a way of communicating that the user is not working, but playing.

Connected to this, technologies that support play might also *allow the residue of playfulness to be displayed*. We have described how photos taken during periods of play provided entertainment when encountered at a later time by other family members, and have learned that householders preferred sending picture messages to displays than to mobile phones. Such messages were partially crafted as a way of showing off wit, inventiveness or artistry.

On a related point, *the crafting of playful messages is reliant upon self-expression, creativity, and a degree of subtlety*. Subtlety in particular is essential if teasing and self-deprecation are to be successfully conveyed. The richness and flexibility of the combination of photography and handwriting in this study provided householders with a range of tools with which to incorporate playfulness into their messaging practices, and a means of transforming the world as photographed into something more playful.

The *provision of simple tools* may also serve to encourage creativity through disinhibition, or by allowing the

constraints of the medium to be usurped. Simplicity also implies a device that is undemanding in its use, unlike other communication media, such as video calls, which might also be considered rich and situated, but carry with them obligations and seem less likely to foster playfulness. Finally, simplicity can allow for the involvement of children, who are likely to focus predominantly on play.

Reciprocity and equality of such tools are essential if recipients are to respond in a like manner. Householders needed someone to play with, and while they could (and did) send playful messages to mobile phones and email addresses, these were sent to other Wayves with much greater frequency. Again, this resonates with the characteristics of play; games are often built on the assumption that conditions are equal amongst players.

A final and overriding design implication is the *provision of a clear structure, combined with a degree of openness*. Supporting a style of interaction that is strongly associated with play, such as clear turn-taking, offers a familiar framework for its occurrence. This, combined with freedom of expression, allows for the development of social conventions and repertoires.

To conclude, our examination of the playful messaging practices that emerged in this field trial, framed in the context of the literature on play, has allowed us to explore the various features of Wayve that permitted and encouraged playful behaviour. By enabling richness and creativity in a structured but risk-free environment, Wayve came to serve as a technological playground: situated and restricted, yet uninhibited and free.

ACKNOWLEDGMENTS

Thanks to Peter Taylor and Simon Lewis for their role in developing Wayve and help during the study, and to Kenton O'Hara for coding messages for reliability purposes.

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