The Magic Box and Collage: Responding to the challenge of distributed intergenerational play

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ABSTRACT

This paper explores playfulness between grandparents and grandchildren, especially when they are separated by distance, and investigates ideas to bridge this separation. We present the result of a three stage investigation; the first an observational study of co-located intergenerational play groups, the second a cultural probes study of distributed intergenerational playfulness, and finally a technology probe study of a system for mediating intergenerational play across distance. In each case we discuss the nature of intergenerational play, the methodological issues, and explore opportunities for technological innovation through the ‘Collage’. We argue that existing knowledge concerning the nature of or support for the young-or-older users engaged in instrumental activities are inadequate when we wish to build understanding of and design for young-and-older users, engaged in collective playfulness.

KEYWORDS

Play; Intergenerational Interactions; Play-across-distance; Design for Young and Old

1 INTRODUCTION

Healthy grandparent-grandchild relationships improve the wellbeing of both parties. Grandchild enjoy the support and guidance offered by mature companionship, whilst grandparents receive a sense of meaning and pride from caring and mentoring (Relationships Australia, 2005)

However, opportunities to enjoy healthy relationships are compromised when grandparents are separated from their grandchildren. This separation may be due to various causes: work arrangements that demand relocation (creating physical distance); intensity of modern life not allowing time for contact (creating temporal distance); family circumstance such as divorce or disputes between adult child and grandparent (creating social distance). Grandparents are increasingly concerned about the problems of maintaining contact with their grandchildren, and grandchildren are missing the stimulation of regular contact. The Australian Government, has acknowledged the problem and begun to respond with policies and programs (Bishop, 2000), but solutions to this problem are not simple.

The use of new technologies and services including email, Internet and mobile phones are helping to ease the burden for some families. However, these technologies do not sufficiently bridge the grandparent-grandchild divide (Evjemo, Svendsen, Rinde, & Johnsen, 2004) and may even
become a focus for intergenerational conflict (Mesch, 2006). What is needed, we argue, is a richer medium for supporting intergenerational interaction; one focused on common grandparent-grandchild activity, such as play.

This paper explores the nature of intergenerational play and opportunities for technologies to mediate playful activities, especially when grandparents and grandchildren are separated. Our approach is user-centred and participatory, which demands an analysis of human activities, motivations and constraints. This paper presents the results of a two year study spanning three phases – from field observations, to design analysis using cultural probes, to the creation and in-situ use of technology to mediate distributed intergenerational play. We discuss each phase in turn, beginning with exploring issues surrounding intergenerational play.

2 INTERGENERATIONAL PLAY

2.1 Grandparents

In response to demographic changes, there has been an explosion of interest in technology for the elderly. However much of the current research characterizes the elderly as frail, impaired, and in need of support. Indeed, some elderly are in poor health, and research that provides access to services and helps to keep them in their home longer (e.g. Mynatt, Rowan, Craighill, & Jacobs, 2001) is vital. However, not all elderly people are impaired, or if they have health issues these are often managed with appropriate care. Many elderly people remain active and lead fulfilling lives well into old age. Our research examines the role older people can play in their grandchildren’s lives. We are cognizant of grandparents’ possible physical impairments, but these are not the focus of our work. We are interested in their contribution as mentors, caregivers, story-tellers and playmates.

2.2 Grandchildren

Children benefit from forming strong bonds with their grandparents at a young age (Blau, 1984). While there may be different expectations concerning the role grandparents play in their grandchildren’s lives (Dellmann-Jenkins, 2005) it has been shown that grandparents have a positive effect on familial interaction and relationships (Griff, 1999). However little has been done to support this relationship with interactive technologies that might help bridge physical, temporal and/or social distances between grandparents and their grandchildren.

Furthermore, even though children are becoming more frequent and experienced users of new technologies, very young children are often absent from technological design (notable exceptions
include Druin, 2002). In order to meet children’s needs in appropriate and fulfilling ways it is important that they are included in the design process. This is particularly important with preschool children who may not be able to clearly articulate their needs and desires. This view coincides with a call for more ethnographic research in the intergenerational field in order to address some of the inherent complexities of intergenerational research (Ward, 1999).

2.3 Play

Technologies for connecting distant family members have typically involved information exchanges and purposeful messaging systems (e.g. Hutchinson et al., 2003). However grandparent-grandchild interactions are often opportunistic, incidental and playful. For young children, especially pre-schoolers, naturally occurring interaction can best be explored through playful activity. Play is common between grandparents and children and is crucial to building their relationship.

There is great deal known about children’s play (e.g. Goelman & Jacobs, 1994; Verenikina, Harris, & Lysaght, 2003), and intergenerational programs generally (Kaplan & Elizabeth, 2004). However apart from an industry sponsored report (British National Toy Council, 2006) and self-help material (De Koven, 2006), there is little research which examines play between grandparents and grandchildren, let alone technologies to support it. Furthermore, while there has been some attempts to explore specific elder-child interaction (e.g. Angersbach & Jones-Forster, 1999; Kuehne, 1988; Newman & Ward, 1993) these tend to take place in formal settings and do not capture the intimate richness inherent in grandparent-grandchild interactions. Other research on the grandparenting relationship tends to focus on practical issues such as gaining access to grandchildren after domestic disputes or the challenges of raising grandchildren, rather than opportunities for fun and leisure.

One example of technology for intergenerational play is Age Invaders (Khoo et al., 2006). Age Invaders a physical game based on space invaders, where players wear RFID shoes, stand on a floor display, shoot their opponents with hand-held guns and avoid collisions by moving around the floor display. Playing Age Invaders remotely is possible, but only via Internet on a desktop computer. Another example is Cur-Ball (Kern, Stringer, Fitzpatrick, & Schmidt, 2005), a game where the senior player throws a ball and tries to avoid obstacles constructed by a younger player far away. Through voice communication, the players negotiate where to best place the obstacles. Both players get points for working together to avoid obstacles.
2.4 Research Design

This paper is not about designing for children per se, nor about designing for the elderly specifically. It is about the interactions that emerge when they are together. Rather than attempting to combine knowledge about each separately, we argue that the emergent phenomenon is best understood by using methods and tools that investigate their shared activity as a whole.

In order to understand and support distributed intergenerational play, we conducted a three-stage investigation. The first stage (section 3) sought to explore the nature of play between co-located grandparents and grandchildren. Gaining a detailed understanding of co-located intergenerational play, helped us to identify some of the prominent features of this activity. The second stage (section 4) presents a study of distributed intergenerational playfulness in the home using a novel cultural probe – the ‘Magic Box’. In section 5 we give the results of an in-situ investigation into the use of a novel technology for supporting playfulness - the Collage. Section 6 draws together lessons learned in relation to the nature of intergenerational playfulness, the research methodological difficulties and opportunities encountered and we reflect on opportunities for technological innovation.

3 OBSERVING CO-LOCATED PLAYGROUPS

In order to understand how to support distributed intergenerational play we thought it valuable to first explore the nature of co-located intergenerational play. We sought to understand playfulness between grandparents and their grandchildren by observing intergenerational playgroups. However, apart from the family home, there are few places where grandparents and grandchildren may play together independent of parental participation and/or intervention. Intergenerational preschool playgroups are one arena where this occurs.

3.1 Approach

We observed three preschool playgroups for grandparents and their grandchildren.

- **Playgroup 1: Small Inter-denominational Playgroup** – initiated by church group, meeting weekly for two hours, usually attended by about ten children, middle-class suburban background
- **Playgroup 2: Large Community Playgroup** – very large, informal, meeting weekly for two hours, usually attended by 60 children, variety of class and cultural backgrounds
- **Playgroup 3: Culturally Based Playgroup** – government funded aiming to cultivate cultural heritage (esp. for refugee families), culturally specific (Chinese), formal structure
We attended six sessions and kept handwritten field-notes of observations and interviews. We used grounded theory methods (Strauss & Corbin, 1997) to create ten vignettes (Wright & McCarthy, 2005). Analysis was structured according to the *play activity* (e.g. game-playing, instruction, performance etc), the *artefact* or toy used in the playful activity and the *roles* (the character or part) the grandparent and grandchild play. A summary of the analysis is presented in Table 1.

3.2 Findings and Discussion

Our analysis found that co-located intergenerational play has a number of salient features.

It was apparent that the grandparents offer a *safe and caring environment* for their grandchild’s play. Most of the grandparent time is not spent initiating play, but rather being concerned with the maintenance of the child’s environment. For example, by selecting play artefacts, by clearing and cleaning surfaces on which playful activity may take place, by removing potentially dangerous items and by providing food and drink to sustain the play.

Grandparent-grandchild interactions tend to involve a high proportion of *phatic* exchanges i.e. interactions that do not specifically aim to exchange facts or information, but act to strengthen their social bonds (Gibbs, Vetere, Howard, & Bunyan, 2005; Vetere, Smith, & Gibbs, in press). Intergeneration play is highly phatic. The phatic aspects of the play were often carried by instrumental activities such as food-making or providing instructions in the use of a device. Rather than achieving a specific goal, the shared activity was an opportunity to pass time together and build rapport. Thus, intergenerational play is *flexible and informal*.

Grandparents and grandchildren are not so preoccupied with abiding by rules of play. Rules are often negotiated in real-time and improvised around found objects and surrounding environments.

Intergenerational play is *short and episodic*. A single play activity is brief and intermittent and is located within the ongoing playfulness of the child. Further, intergenerational play is often interrupted or abandoned when something else captures the attention of the child. Intergenerational play is *open* – open to interpretation, open to negotiation and open to disruptions.
A range of artefacts were used to mediate play. These artefacts were sometimes intangible (e.g. song) but were more often physical artefacts. These tangible play-things were both solid (e.g. bicycle) and malleable (e.g. food, play doh). Even the human body was used as a play artefact (vignette 3, 5, and 6). The range of items, and the ease with which they are appropriated when useful, and abandoned when not, further supports the flexibility inherent in intergenerational play. This flexibility is a testament to the imagination of the players, which often resulted in whimsical play.

Even though there is a common shared artefact that mediates the play, their roles were different. The play afforded an asymmetrical behaviour. While we would typically associate grandparents with a carer, organiser or instructing role – especially through story telling (Beland & Mills, 2001) – we would not automatically see them as entertainers, teasers or a ‘straight-guy’ to a child-centred comic routine. Equally while we might expect grandchildren to play a subservient role (e.g. apprentice, imitator and follower) we do not often envisage the grandchild as an initiator, an equal player, or wilful resistor. Intergenerational play also has a strong physical dimension. Grandparents would often sit down, physically placing themselves at the same level as the child, playing in a childlike manner, dancing, and singing.

3.3 Implications

These results, though based on a relatively small study, have implications for the way we approach the creation of technology to supported intergenerational play. Our designs should be: safe, clean and interesting; allow flexible, intermittent play; support the various roles grandparent and grandchildren play; and accommodate the social, physical and intellectual differences of the players.

While this first study delivered some significant ideas, the play was co-located. We were interested in exploring the implications of these results for distributed intergenerational play. Our second study investigated distributed interactions explicitly, by use of a new type of cultural probe.

4 MAGIC BOX PROBE FOR DISTRIBUTED PLAY

In our second study we sought to explore the distributed nature of play, while simultaneously observing intergenerational interactions directly. Despite the growing popularity of multiplayer online games, they lack most of the characteristics identified in our first study. that we wanted to investigate in a distributed setting. We adopted and adapted a cultural probes approach (B. Gaver,
Dunne, T. and Pacenti, E., 1999) to better understand distributed intergenerational play and to provide insights for designing technology to support it.

### 4.1 Cultural Probes

Cultural probes are research and design tools for collecting snippets of everyday life. A cultural probe can be any object used to capture events or thoughts, either occurring naturally or provoked by the investigators. Scrapbooks, diaries, cameras, postcards, stickers, maps, voice-recorders (Crabtree et al., 2003; B. Gaver, Boucher, Pennington, & Walker, 2004; Mattelmäki & Battarbee, 2002; Vetere et al., 2005) and mobile devices (Hulkko, Mattelmäki, Virtanen, & Keinonen, 2004; Iversen & Nielsen, 2003) have all been used as cultural probes.

At first glance, cultural probes seem to be well suited for exploring intergenerational play. They have already been used successfully to study family life (Horst, Bunt, Wensveen, & Cherian, 2004; Hutchinson et al., 2003; Vetere et al., 2005) and provide an excellent way to collect longitudinal data about commonplace activity. They give participants resources for interpreting their own practices by encouraging critical reflection about these practices.

Despite their benefits, there are aspects of cultural probes – as they have been typically constructed and deployed – that make them problematic for investigating distributed play. Cultural probes are typically designed to probe individuals, not the common activity of pairs or groups of people. Traditional cultural probes gather individual insights about group interactions, but tend to miss data about the activities that emerge from shared interactions. Traditional probes do not directly capture exchanges between people, but reflections and recollections about those exchanges. This difference is illustrated by comparing a researcher’s request to young child asking her to “tell me what game you’d like to play with your grandmother” and alternatively by observing the actual play in action. Since we are concerned with play, which is essentially shared and collaborative, it is important that we have tools that effectively capture this experience.

Cultural probes have been used with the elderly (B. Gaver, Dunne, T. and Pacenti, E., 1999) and with children (Iversen & Nielsen, 2003). Hutchinson et al. (2003) used technology probes for grandparents and grandchildren but the children were older than our target group, and their research focus was communication not play. In order to probe distributed intergenerational play, we need a probe that appeals both to the very young and the elderly.

In designing this probe we wanted something sufficiently open and flexible to allow participants to appropriate and use it in novel and playful ways, yet be affordable and easy to deploy as a research tool in a short amount of time and required little infrastructure to implement. We
wanted something that was a medium for play, yet for it to be open to scrutiny by us without invading the privacy of domestic life. Since we are dealing with young children and their grandparent, we wanted something that was not overly reliant on the reflective practices or literacy abilities of our participants in the way a diary or scrapbook might be; something that is suitable for the very young to use and understand, yet not childish or trivial for adults. Finally, we wanted something that whimsical spirit, and the ability to engage the imagination of both children and adults. The challenge was to support the exchange of things that were both intrinsically meaningful to grandparents and grandchildren, and revealing to researchers.

4.2 The Magic Box

Our response to these challenges was the Magic Box. The Magic Box (Figure 1) is a cultural probe designed to investigate playful activity between very young children and their grandparents.

**INSERT FIGURE 1 ABOUT HERE**

It was a physical box, large, but easily carried, both colourful and attractive. Each evening a ‘Magic Box Fairy’ (in reality a hard-working researcher) exchanged the Magic Box between the homes of the grandparents and the grandchildren. The Magic Box was intended to evoke enchantment and excitement comparable to Christmas or other gift-giving celebrations.

The Magic Box is comparable to the Peek-A-Drawer device (Siio, Rowan, & Mynatt, 2002), where a photograph of an object placed in a chest of drawers appears in another far away place. Both devices are box-like and aim to support the exchange of everyday items. However, the Magic Box allows the exchange of actual objects, rather than just their photographic representation, and the Magic Box exchanges are constrained by the Magic Fairy who only comes once a day, whereas Peek-A-Drawer is available on-demand. Rather than being a disadvantage, these constraints generate interesting insights, as we discuss later.

4.3 Approach and participants

We recruited six families to participate in a two-week study (Table 2). Within each extended family, there were two grandparents (age from 61 to 89 years old) and two or three grandchildren (aged between 2 and 10 years). We originally aimed to recruit only grandparents and grandchildren to the study, but quickly found that the involvement of the grandchildren’s parents was crucial and included them as well. The parents were aged between 32 and 43.
The grandchildren in each group were siblings and lived in a separate house from their grandparents. This distance separating them was between 5 and 10 km for all families, except for family D who were a short walk away. Each grandparent usually had some form of contact with their grandchildren (e.g. telephone or visit) every week.

In the first week, grandparents and grandchildren used conventional cultural probes to record and reflect on intergenerational relationship. The conventional cultural probe pack included scrapbooks, catchphrases on coloured labels (e.g. “I love it when we …”), a Polaroid camera, a variety of stationary items (stickers, stencils, pens, crayons, scissors etc.) and postage items (stamped envelopes, post bags, small boxes, cardboard tubes, stamps etc.). The postal items were intended to prime our participants for the Magic Box, by allowing them to easily send items via the post. At the end of the week, we collected the probe materials and interviewed families about their experiences.

At this meeting we replaced the postage items with the magic box cultural probe. Each household was asked to think about items significant to the grandparent relationship and place that item in the box. The Magic Boxes were placed on the doorstep before 7 pm, and during the night the ‘Magic Box Fairy’ swapped the boxes between the two households. During this exchange, the contents of each box was noted and photographed. Families were asked to use their scrapbooks to document, record and reflect upon items in the Magic Box and the contents were discussed at the final interview. Magic box exchanges continued each night for one week. At the end of the week, families were again interviewed about their experiences.

4.4 Findings

The Magic Box afforded and constrained playful engagement in distinctive and interesting ways. Families appropriated and misappropriated the boxes. Although it was occasionally to family routines, they enjoyed the experience. We report on a number of other important features from the Magic Box study.

4.4.1 Tangible exchanges

We were keen to move beyond the exchange of informational artefacts common in earlier scrapbook and diary based studies. All families made use of the box to exchange large physical material artefacts – artefacts that would not fit in a scrapbook or diary. Common items included
framed photos (typically from the grandparents), food (exchanged by both grandparents and grandchildren), found objects of various kinds (leaves, feathers etc.) and made objects (frequently created by the grandchildren and given great credence by the grandparents).

An example of tangible exchange occurred when Aaron sent a query via the Magic Box “I wonder what Grandma looked like as a teenager”. This motivated his grandmother to find photographs of herself and other family members as a child. She sent her grandchildren photos inviting them to “find your mum” (Figure 2). The photos were often framed and accompanied with a request for safe keeping.

Food was another important tangible mediator of family relationships. Gifts, where there had been an investment of time or labour (as in home-grown vegetables), were prized. The eating and distribution of food was significant. For example grandparents making vegetable soup from vegetables sent by grandchildren (family D) and mandarins as a reminder of a memorable family holiday (family A). Interestingly, the final Magic box for all families included a food item.

4.4.2 Rhythm and Routine

The production and consumption cycle facilitated by the magic box was anchored to the start and end of each day by the fairy’s daily visits. The rhythm imposed by the fairy encouraged the routinization of the stocking and opening phases, and the attendant item collation and creation that stretched throughout the day.

Participants were given prepaid postage packs in the first week. These were, in part, aimed to prime them into the habit of distributed exchange. However these postage packs were barely used. Conventional postal exchanges differ from the Magic Box: they introduce unpredictability into the precise delivery time; they are less convenient; and delivery and pickup time are not tied to the sleep/wake cycle of the family. Even though there was a time gap between leaving the box by the front door and opening it the next day our families experienced box exchanges as close to synchronous communication, with sleep filling the interval. This heightened engagement in the process.

The Magic Box created a sense of obligation that no family resisted. Magic Box exchanges were reciprocal in interesting ways. Information oriented exchanges (e.g. question and answer
pairings) were rarely left before closure had been reached, whereas phatic or gifting exchanges were rarely found wanting of an in-kind response, though closure here is not so easily detected.

### 4.4.3 The Magic Box Fairy

Each evening, after sunset, the magic box fairy discretely collected and exchanged the boxes that were placed on the porch or by a tree or under a bush in front of the house. She had an important influence on the way the magic box was received.

The Magic Box fairy was a positive means of engaging younger participants. Each family had at least one child young enough to believe in the Magic Box fairy. This child ensured that the whole family participated in the magical element of the exchanges. The parents, grandparents and elder children worked hard to maintain the mystery for the younger children. Frederick (Family F, aged 78) was keen to discuss, within earshot of the children, the fairy’s remarkable ability to leave the box without triggering the driveway’s auto-light. Older children, the ‘non-believers’, became co-conspirators in keeping the secret. Betty (family B) wrote that “the magic box fairy was a highlight of the project” but that “we could not find any fairies (at the bottom of the garden) like the one that takes and brings our boxes”.

The fairy became a focus of attention as participants wrote notes, drew pictures and even sought to feed the Magic Box fairy by leaving gifts of food for her, much as a child might leave a carrot for the reindeer on Christmas Eve. One family referred to her as the “pushy” and “bossy” fairy because she demanded daily attention. Another family were worried that the Magic Fairy would be “offended” by the contents in the box.

### 4.4.4 Flexibility

The Magic Box exchange was used opportunistically by the grandparents to pass on family heirlooms such as family photographs and toys. However there were some unanticipated elements to the exchanges. It was occasionally appropriated by parents for instrumental (e.g. the exchange of cough medicine) and mundane (e.g. weight-watchers book) exchanges. to the Magic Box was also used to return previously sent items or had been left while visiting the other residence.

### 4.4.5 Disruption

The Magic Box was a special type of disruptive technology. Old communication practices were inherited, new practices emerged, and family routines were restructured. The box was often accompanied by anticipation and excitement. One grandmother commented, “I really enjoyed spending the day thinking about what to put in the Magic Box”. This sense of anticipation was matched by the children’s delight who were eager to collect the box and see its contents.
Although families reported that children would wake up early to open the boxes and miss breakfast before school and grandparents would stay up late to open the box before bedtime, families regreted the loss of the box. The Magic Box was not a ‘calm technology’ (Weiser & Brown, 1995); indeed it was a disruption to family routines, but overwhelmingly a welcome one.

4.5 Reflections

We were encouraged by our experiences with the Magic Box. We found it to be engaging and informative. Perhaps the most obvious innovation in the magic box is its ability to directly capture intergenerational exchanges of physical objects.

There are however some limitations and implications. Magic Box studies are invasive; their value is that they are disruptive in interesting ways. Family routine was impacted by the regular ‘mini-Christmases’ that were visited on the families and so obligations to engage were keenly felt. Also, Magic Box studies are unlikely to be scalable in either participant numbers or duration. A sense of magic and novelty are closely linked, and sustaining the mystery over long periods of time would be difficult to achieve.

Furthermore, we hadn’t taken sufficient account of the role of the parent. We quickly found that from the grandchild’s end of the exchange, the participation and facilitation and encouragement from the grandchildren’s parents was crucial to the exchanges. ‘Buy-in’ from the parents at level greater than approval for the study to be conducted was essential. For example, one mother structured the day’s activity for her daughter and son around collecting items such as gum leaves to put in the magic box. Other parents encouraged their children to write messages, draw pictures or make food to send to their grandparents.

5 USING THE COLLAGE TO MEDIATE INTERGENERATIONAL PLAY

In the third stage of our research, we used the result of the Magic Box study, and the play groups study before it, to inform the design of a technology probe (Hutchinson et al., 2003). In setting out to design a technology probe for intergenerational play-at-a-distance we wanted to develop something that resembled the activities we witnessed in the Magic Box exchanges. We wanted a technology probe that allowed the sharing of everyday experiences, allowed for story telling, allowed the sharing of family history and allowed for the creation of new experiences – all within a context of play. These suggested a number of features for our technology probe.
First, we wanted something that could operate at a distance. However, we wanted this operation to involve minimal ongoing intervention from the researchers themselves, while allowing us to observe the transactions between participants.

Secondly, the technology probe needed to be usable and engaging for both young and old. However, we also understood that any use by children would require intervention and facilitation from parents, especially for pre-school aged children. Children in both the playgroup and Magic Box study enjoyed manipulate tangible objects. This suggested that the technology probe should allow for direct manipulation of objects.

Third we wanted to design a technology that broke from established routines within the domestic environment. We sought to design a technology that was novel and/or interesting to participants rather than mundane and/or ordinary. Yet, the technology probe needed to be familiar and simple enough to be readily appropriated by all parties in a short amount of time. That is, we wanted our technology probe to be disruptive, yet quickly domesticated.

Finally, we wanted to recreate the reciprocal exchanges that engaged participants in the Magic Box study. While the Magic Box was an asynchronous technology that involved a series of turn taking in exchanges, synchronicity was approximated by limiting the wait to sleep hours. Our technology probe would aim to capture both the permanence of asynchronous exchanges and the interactivity of synchronous play.

These considerations guided this next phase of our research and the creation of the Collage.

5.1 The Collage

The Collage was a technology for mediating intergenerational play. The Collage was an attempt to translate the knowledge of intergenerational play gathered in the first two stages into a mediating technology. The Collage consisted of shared displays. It used mobile camera-phones as an input device and a touch screen for synchronous interaction between distributed children and their grandparent (Figure 3).

The Collage built on existing infrastructure and domestic technologies. It ran on broadband services and mobile phones. Mobile phones were important, as they allow distributed family members to capture and share information about their daily lives, when not co-located.
Two computers (Windows PC with wireless network cards) were installed in each home. Only the touch-screen visible; keyboard, mouse and computer were hidden. A wireless router was connected to the family’s existing modem, thereby establishing a wireless connection to the computer. Participants were provided with Nokia 7610 camera phones. These were used to send a multimedia message (MMS text or image) to a specified email address. A Java application extracted the text and images from a POP3 compliant mail server and transferred these onto a MySQL database. A local flash file communicated with a Flash Media Server and the Apache/PHP HTTP server send images and texts to the Collage touch-screen display. A schematic of the set-up is shown in Figure 4.

INSERT FIGURE 4 ABOUT HERE

Photographs and text messages appeared on large (19 inch) touch screens, located in prominent, high traffic areas. In the grandparent’s home it was placed in the lounge room, on top of a small side table next to the television. This enabled the grandparents to sit in their comfortable chairs, casually monitoring the display out of the corner of their eye while also watching television. In the grandchildren’s home the touch-screen was located in the kitchen/dining room on a large table which was occasionally used for family dinners. The youngest child enjoyed the novelty of having permission to use a chair to climb onto the table to play with the screen. In both homes, the location of the display was more likely to have a ‘disruptive’ impact on the family, in the same way as the magic box.

Photographs and text messages cascade down the screen in waterfall-type manner. They were positioned randomly on the screen and shaped in various sizes (while maintaining the rectangular format). Once they reach the bottom, the items reappear at the top of screen and cascade again. More recent items cycled more frequently and were closer to the foreground. The older items cycled less frequently and could be obscured by newer items.

The items on the touch screens were manipulated with a finger. Simple finger actions had natural consequences on the items:

- Touching the item … stopped it from moving
- Dragging the item (from its centre) downwards … started it moving again
- Dragging the item (from a corner) diagonally … enlarged or reduced its size
- A double-touch on the item … enlarged it for closer viewing
Flicking the item to the left or right … deleted it

These simple manipulations were suitable for the motor skills of young children and the elderly and added a tactile element, which was an important in magic box exchanges.

Both Collage displays received the same content at the same time. If an item was manipulated on one display, this was seen on the other display in real time. Thus any movement of an item on one screen is seen on the other, consistent with a WYSIWIS design (Stefik, Bobrow, Foster, Lanning, & Tatar, 1987). A grandparent can see when their grandchild is playing with items. Control over the item is allocated to the first person to touch it. Latency was not a discernable problem, since the file sizes were quite small (typically 50KB for a photograph) and the interaction was not overly dependant on it.

There are similarities between the Collage the technology probes described by Hutchinson et al (2003). Both mediate distributed families and both use contact sensitive screens (messageProbe uses tablet, Collage uses touch-screen). However there are important differences. The Message Probe and Video probe aimed to support communication explicitly (via digital post-it notes) whereas Collage is not communicative tool, but a medium for play. Also input to the messageProbe and the videoProbe are ‘deskbound’, whereas input to the Collage is via a mobile phone, which is used in the ‘field’, situated in the context of an activity. Nevertheless, the Collage shares many of the characteristics of a technology probe and continues the probe-like metaphor of the Magic Box.

5.2 Approach and participants

The Collage was used by one family over eight weeks. We invited Family E (Table 2) from the Magic Box study to continue their involvement in this research.

We gave not prescriptive instructions on how Collage should be used, but requested that they made at least one post each day. We asked the families to keep the display running all the time, although the grandparents chose to turn the screen off when sleeping.

5.3 Findings

5.3.1 Photographs

Over the period of eight weeks the family exchanged a total of 487 photographs; 306 sent by the children and 181 by the grandparents. Most of the photographs created by the children were self-portraits, often capturing a particular part of the face - an eye, a protruding tongue, a smile, a nose. The photographs showed the children being playful and whimsical - pulling faces, poking out a tongue and holding ‘rabbit ears’ above their brother’s head. The children sent photographs of themselves in various situations, e.g. with their favourite toys (such as teddy bears), with
constructions they had made out of Lego or with their pets. Other photographs were of the children playing on the beach, in the sandpit, on heavy machinery (belonging to their father), in the garden, and swimming at the local swimming pool.

Eddie (4 yo) sent more than a dozen photographs of cars and trucks. These were toy trucks and cars which he had arranged at home, photographs of his father’s trucks and other moving equipment parked in his backyard and at different working locations, and many random photographs of cars and trucks parked or moving on the road. He took many of these photos out of the back window of his parents’ car. Even though he had no problems taking photographs, he found the button sequence for sending to the Collage difficult. So Eddie would hand the phone to his older brother Ethan or mother Emily, who would post them to the Collage.

In contrast, Ethan’s (9 yo) photographs tended to be about particular events. He sent many photographs associated with his activities in Cub Scouts (an organization for pre-teen children). Ethan took the camera away with him on a Cub camp, and he took a number of photos of his surroundings, his lodging and his friends who were engaged in activities such as archery, riding a flying fox, and camping. Other included photographs of his leaders, his friends, and the hall in which they meet. Ethan also took photographs of other events such as his school Christmas picnic, his performance in the school-choir in the local shopping centre, and winning the Christmas raffle. These photographs helped to keep his grandparents aware of his activities.

Edith (68) claimed ‘ownership’ of the phone and so took most of the photographs. Edgar (69) did not carry the phone with him, and so did not take many photographs. He only took photographs when Edith asked him to. Edith sent photographs every day, being careful to take photographs of things she thought would interest the grandchildren.

The mother Emily (38 yo) also occasionally took photos. She would take photographs of children when they were engaged in play and occasionally photographs to tease them. On one occasion, Eddie, Ethan and their two teenage cousins were seated in the lounge room playing with the touch-screen. Unbeknownst to them, Emily took photographs of them as they were watching the screen. The children were surprised by the unexpected photograph. This became a source of entertainment throughout the family.

The subject of the photographs changed over time. Initially the photographs were mundane; reflecting domestic, everyday surroundings – such as the house, garden and family pets. Over time the photographic subject became about special events such as Christmas, family dinners, a school picnic and the camp. The photos then reflected the passage in time within their familial interactions.
5.3.2 Text messages

48 text messages were sent. This is fewer than the number of photographs but not surprising given that neither the grandparents nor the grandchildren were skilled at composing text messages on the mobile phone, and it took longer to compose and send a text message than it did to create and send a photograph. Nevertheless, text messages played an important role in the Collage. So much so, that as a result of the Collage the grandmother became very skilled at composing text messages. The Collage, and its ability to connect her to her grandchildren, provided the incentive for her to learn this skill.

Like the Magic Box, the parents also appropriated the Collage for their purposes. The mother, Emily, used text to alert grandparents about new messages (e.g. “I sent some photos of woodcarvings”), to open up conversations for discussion (“Today is scarecrow day at Gymbaroo. How things come in handy”) or to indicate location or status (“We are on our way!”) – similar to a situated public display (Cheverst, Dix, Graham, Fitton, & Rouncefield, 2007).

Rather than compose a text message, Emily occasionally wrote a message on a piece of paper and send a photograph of herself holding the message. This happened on special occasions, such as when the children stayed overnight at the Grandparents home, and on the father’s birthday.

5.3.3 Evoking family history

Emily’s message about scarecrow day (“Today is scarecrow day at Gymbaroo. How things come in handy”) was a reference to the costume that Eddie was planning to wear to Gymbaroo (an association for pre-school children) that day. Edith had made this costume for Emily many years ago when she was a young child, and Emily had not thrown it out. After sending the text, Emily sent a photograph of Eddie wearing the costume, thus keeping of record of it on Collage. This example reflects the family’s practice of never throwing things away (which may have arisen from their sense of loss of family memorabilia experienced by the grandparents during WW2). The scarecrow costume is an example of the family building their family identity through Collage. This hoarding attitude extends to photographs on the system. Emily said “we keep things … I would never throw a photo out. Never. Regardless of how bad it is I would never throw it out”. Just like the Magic Box, the Collage not only acted as a vehicle for carrying family memorabilia, it enabled family stories to be reborn and re-enacted anew. Just as the Magic Box seemed to beckon long forgotten mementos hiding somewhere in the home (e.g. two robins and a bird nest made from seedpods by the great-grandfather in family C), the Collage acts seemed to entice family stories through images and text, and helped to embed these in family folklore.
5.3.4 Ambiguity

Grandparents and grandchildren would at times compose a message containing both text and images. However the Collage would display the text and message separately, i.e. the text would not be attached to the image even though they were sent at the same time. The dislocated items would appear independently. We expected this to cause some frustration. Nevertheless we purposely decided to use the ambiguity created by the separation as a ‘design resource’ (W. Gaver, Beaver, & S., 2003), allowing serendipity (Leong, Howard, & Vetere, 2008) and opportunities for play.

Unsurprisingly, Emily found that “the texting with the photo was a problem”. However we also found family members seemed to enjoy co-locating text and photographs. This may have been grudging response to the lacking functionality, but we have reason to believe otherwise. The dislocated items generated a variety of familial discussion especially when a text was placed along side an ‘incorrect’ image. On one hand the mother and grandmother reported their frustration at having to coordinate the text and photos (the children reported no concerns), and on the other hand they spoke of the fun that these interactions afforded.

The ambiguity in the Collage is justifiable because it is not principally a communication device. Even though it can be appropriated for communicative purposes (as the parent did), Collage is a mechanism for distributed play and phatic interactions. Its communicative functions are purposefully under-developed. Communication that depends on the exchange of complex information is better served by existing means (e.g. voice telephony, email). Collage aims to be suggestive and playful, where rules and meaning are negotiated.

Ambiguity extended to other ‘absent’ functions. Photographs and items are not time-stamped, nor are there any markings to identify their sender. These ‘functions’ may be desirable in a communication device, and they would be very easy to implement, but they arguably work against opportunities for play. Being strongly motivated by notions of play, and our experiences of the Magic Box, we did our best to design ambiguity into the Collage.

5.3.5 Rhythms and Routines

Like the Magic Box, interaction with the Collage tended to take place around particular times of the day. However where the rhythms of the Magic Box emanated from the Magic Box Fairy, the rhythms of Collage became part of family routines. Eddie tended to play with the collage system in the mornings. The grandfather, Earnest, tended to spend much of his time watching television, and since the Collage touch-screen was positioned next to the television, he would be the first person to notice the movements on the display. Earnest would notify Edith that Eddie was playing on the collage system and she would come and sit down and play with him. Grandparent would “just
know” it was Eddie because it was that time of day and because of the particular way he’d interact with the Collage. The grandparents believed they could identify which of their grandchildren was on the other end by the types of arrangements, selection of photographs and time of day. But they were never sure; which only contributed to the playful aspect of the interactions.

The afternoon brought another routine. Collage interaction was more likely to originate Ethan, home from school at around 4:30pm. Emily was usually preparing the evening meal in the kitchen, and the children were relaxing. The timing of the interaction was also a source of some tension between family members because the children’s father believed that the collage system was distracting Emily from making the family dinner.

Just as the Magic Box created a sense of anticipation over its arrival, so too expectations were established around the Collage. Grandparents and grandchildren expressed disappointment if these expectations were not met. So they worked out a way of flagging their intentions to play. Earnest would select a photograph at random and wave it rapidly for side to side as a signal to capture the attention of the children. Emily, would often ‘keep an eye’ on the screen, occasionally glancing at the Collage in the same way she’d periodically watch over a third child. If she saw a new photograph she would stop what she was doing, go to the screen, touch it and stop the photograph moving so that the children could see it when they next passed by. Unsurprisingly, therefore the Grandfathers’ call for interaction was usually first recognized by Emily who would let the children know that someone wanted to play with them.

5.3.6 Playful interactions

Eddie would often select photographs and lay them out in rows along the screen, like a deck of cards, or aligning toy trains as children did in the first playgroup study. Once the first row of photographs was complete Eddie would select another cascading photograph and start a new row. In response, his grandfather – sitting alongside Edith in their home many kilometres away - would select one of the arranged photographs and enlarge it. Eddie would re-touch the photo and shrink it to a much smaller size and reposition it in the row. At other times Eddie would enlarge photographs that were important to him (e.g. trucks) as if to showcase them for his grandparents. In response the grandparents’ would reduce the photo to a small size and displace it elsewhere on the screen (usually out of a row). This became a game, with the grandparents deliberately teasing Eddie by enlarging photographs that they knew he would not want enlarged. Eddie would respond two or three times by reducing and relocating photographs then in exasperation he would yell at the screen “I don’t want that one big!” and he would take hold of the photograph and flick it off to the side of

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the screen, thus deleting it from the collage and emphatically signalling the end of that particular interaction. The Grandparents were aware of Eddie’s frustration, but they continued this tease, again reminiscent of the intergenerational banter we observed in playgroups.

Ethan’s interactions were less volatile. He would primarily engage in turn-taking with the grandparents, stopping and enlarging photographs which were important to him. These photographs were usually pictures he had taken when not with his grandparents (for example, photographs of things he had made at school, himself on Cubs’ camp or at his father’s farm) and knew would be of interest. The grandparents would take their turn, enlarging photographs they found interesting. These interactions mimicked traditional games of ‘show and tell’.

Interactions lasted about 15 minutes. There was no negotiated method to signal the end of the interaction (compared to their photo-waving behaviour to indicate the start). Generally the interaction ended when the children became distracted, were called away, or had simply had enough of playing. They all knew the play ended when there was no response to repeated interactions.

5.4 Implications

The Collage merges aspects of both co-located intergenerational play identified in our study of playgroups and of distributed play observed in the Magic Box. The Collage mediated distance between two very different groups of people – the elderly and the very young. As a technology probe it also contributed to knowledge about distributed intergenerational play. Grandparents are concerned that playful activity is safe and clean as well as engaging. Grandchildren require that playful activity is not rule-bound, that it can be easily initiated and abandoned without repercussions. Play should also encompass tacticity, it should be flexible, engaging, and allow expressions of whimsy. Grandparents appreciated that Collage allowed them to pass on lived experience in the guise of storytelling, sharing of family history and the creation of new experience within the context of playful activity.

Electronic photographs and text became both the subject and object of intergenerational playful encounters. Grandparents and grandchildren engaged in playful ‘dances’ by taking turns at orienting the photographs and participated in mock ‘tug of wars’ over which photographs should be most prominently displayed. They teased each other by sending photographs and text messages that were intentionally unusual or ambiguous. Furthermore, despite its ability to disrupt family routines, the benefits afforded by the Collage were more than enough compensation.

While there are limitations – for example, it is unclear how Collage would scale to more than two families, and also how families would adjust to time-zone differences – its success lies in that it
allows families to express some their traditional forms of co-located social engagement over a distance. These forms of engagement include playful activities, but also extend story-telling, gift-giving, and confirmation of social roles.

6 CONCLUSION

This paper has explored the issue of playfulness between grandparents and grandchild, particularly when they are not co-located. We have presented the results of a three stage investigation encompassing an ethnographic study of co-located intergenerational play, a cultural probe study of distributed play, and a technology probe study for mediating play across a distance. We have found that intergenerational play is typified by flexible, informal encounters which are short and episodic. A range of artefacts are used to mediate play, and a variety of roles are adopted by both young and old players. These findings had implications for technology design which seeks to design for grandparents and grandchildren as one group, rather than as two separate entities. In particular, we have highlighted that system design must be flexible; allowing for the expression of different roles.

Finally, Collage has provided a foray into the largely unexplored world of designing technology which seeks to support playful encounters between grandparents and their separated grandchildren. It is hoped that some of the lessons learned from this research may be employed in future technological design which aims to support a variety of intergenerational strong-tie relationships.

7 ACKNOWLEDGEMENTS

We would like to acknowledge the support of the Smart Internet Technologies CRC and Nokia Research Finland. We also thank the many families who participated with generosity and good humour. Special thanks to Ivo Widjaja for his tireless efforts ensuring the Collage ran smoothly when needed.

8 REFERENCES


FIGURES

Figure 1: The Magic Box is a cultural probe that carries objects between grandparents and grandchildren.

Figure 2: Agatha (grandmother A) uses the Magic Box to play a guessing game about family history.
Figure 3: The Collage uses camera-phones as an input device to post photographs and text messages to a touch screen display. The touch-screens are placed in the homes of the grandparents and grandchildren and show the same items cascading down the screen. The items can be manipulated for synchronous play.

Figure 4: Schematic layout of the Collage
### TABLES

<table>
<thead>
<tr>
<th>Vignette</th>
<th>Activity-Type</th>
<th>Artefact</th>
<th>Grandparent Role</th>
<th>Grandchild Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Instruction</td>
<td>Food [pastry]</td>
<td>Instructor</td>
<td>Apprentice</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Imitator</td>
</tr>
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<td>2</td>
<td>Sense of Presence</td>
<td>Toy [train &amp; track]</td>
<td>Companion</td>
<td>Initiator</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Egocentric [centre of attention]</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Reassured [feeling safe]</td>
</tr>
<tr>
<td>3</td>
<td>Performance</td>
<td>Song</td>
<td>Entertainer</td>
<td>Initiator</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Human body [knee]</td>
<td>Comforter</td>
<td>Audience</td>
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<td></td>
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<td>Game</td>
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<td>Organiser</td>
<td>Co-player</td>
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<td>Food [fruit]</td>
<td>Co-player</td>
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<tr>
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<td></td>
<td>Language [joke]</td>
<td>Teaser</td>
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<tr>
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<td></td>
<td></td>
<td>Straight-guy</td>
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<tr>
<td>6</td>
<td>Performance</td>
<td>Song</td>
<td>Co-player</td>
<td>Co-player</td>
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<tr>
<td></td>
<td></td>
<td>Human body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Instruction</td>
<td>Appliance [camera]</td>
<td>Instructor</td>
<td>Follower</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Unconfident [seeking reassurance]</td>
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<tr>
<td>8</td>
<td>Physical Play</td>
<td>Toy [bike]</td>
<td>Co-player</td>
<td>Compliant</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Food [cracker]</td>
<td>Carer</td>
<td>Initiator [desire to ride]</td>
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<tr>
<td>9</td>
<td>Creative Play</td>
<td>Craft-item [playdoh]</td>
<td>Organiser</td>
<td>Co-player</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Compliant</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Apprentice</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Physical Play</td>
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<td>Carer</td>
<td>Wilful [seeking independence]</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Organiser</td>
<td>Resistor [refusing to accept change]</td>
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**Table 1: Artefacts and Roles in Co-located Intergenerational Play**

<table>
<thead>
<tr>
<th>Family</th>
<th>Grandparents</th>
<th>Parents</th>
<th>Grandchildren</th>
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<tbody>
<tr>
<td>A</td>
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<td>Alison (43)</td>
<td>Abby (6)</td>
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<tr>
<td></td>
<td>Arthur (70)</td>
<td>Andrew (42)</td>
<td>Aaron (9)</td>
</tr>
<tr>
<td>B</td>
<td>Betty (61)</td>
<td>Bronwyn (32)</td>
<td>Bella (2.5)</td>
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<tr>
<td></td>
<td>Bruce (65)</td>
<td>Brad (33)</td>
<td>Bronte (4)</td>
</tr>
<tr>
<td>C</td>
<td>Cliff (63)</td>
<td>Colin (~35)</td>
<td>Cassie (2)</td>
</tr>
<tr>
<td></td>
<td>Colleen (64)</td>
<td>Cathy (~35)</td>
<td>Callum (4)</td>
</tr>
<tr>
<td>D</td>
<td>Donna (81)</td>
<td>Della (41)</td>
<td>Danny (3)</td>
</tr>
<tr>
<td></td>
<td>Donald (89)</td>
<td>David (40)</td>
<td>Domenic (8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Darcy (10)</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>Edgar (69)</td>
<td>Emily (38)</td>
<td>Ethan (9)</td>
</tr>
<tr>
<td></td>
<td>Edith (68)</td>
<td>Evan (39)</td>
<td>Eddie (4)</td>
</tr>
<tr>
<td>F</td>
<td>Frederick (78)</td>
<td>Francis (33)</td>
<td>Francesca (6)</td>
</tr>
<tr>
<td></td>
<td>Flora (58)</td>
<td>Fiona (33)</td>
<td>Fia (3)</td>
</tr>
</tbody>
</table>

**Table 2: The names (pseudonyms) and ages (in years) of grandparents and grandchildren**

*All grandparents are maternal except those indicated by p being paternal*