

# 'Time' and the Design of Familial Social Connectivity Systems

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## ABSTRACT

We introduce a multi-location interactive touch screen based system (Collage), which enables the sharing of digital images and textual content between distributed intergenerational familial homes. We further explore the significance and importance of 'time' for designing technologies, which aim to support social connectivity between families.

The collage system was utilized by three independent families, named A, B and C (Figure 1). Each family had at least two homes, typically one for the Grandparent's (GP) and one for the nuclear family. Family C had three different homes for the same extended family. The system ran for between 6 to 10 weeks in each of the three settings.

The study encompassed in-depth interview data, supported by videotaped observation, and analysis of system audit logs, which reveals participants' experience of the system. In this paper we highlight the temporal structures embedded in the users everyday activities with Collage and the temporal affordances of the system itself. We maintain that these temporal factors provided family members with a resource for sharing, receiving, and managing their social interactions through Collage. We conclude by articulating design implications for intergenerational social connectivity systems with an emphasis on temporality as a design resource for mobile and networked image displays.

## Author Keywords

Social connectedness, temporal aspects of interaction, handheld devices and mobile computing,

## ACM Classification Keywords

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

## INTRODUCTION

In her paper on the effects of mobile technology on temporal organization, Nicola Green, argues that new mobile rhythms are "embedded in very familiar, but locally defined, temporal practices." [5] She argues that they differ according to social groups and therefore need to be understood not only on a descriptive level, but also on a local or 'qualitative' level.

The study outlined in this paper builds on work in intergenerational play conducted by members of the research team [10]. This paper extends this body of work by

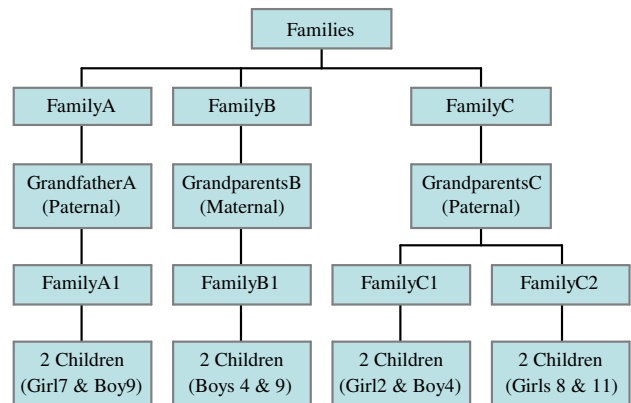


Figure 1: Summary of participants

examining the temporal aspects of interaction with family members through Collage.

As part of growing research into the realm of technology support for strong tie relationships, several researchers have investigated the role that distributed presence displays and collaborative messaging systems can play. For example, Cheverst et al's [1] work on situated display messaging and Microsoft's HomeNote [7] system amongst others [4,8]. These systems share similar goals; however, significant similarities and differences also emerge according to the kinds of data that researchers draw upon in their analysis. Different data produces different stories, for instance a number of researchers have focused on log data [1,2] as a means to eliciting a rich picture of users experiences. However, there is a paucity of literature that examines the temporal aspects of social interaction and technology in use. As such, we highlight the significance of time in terms of i) the lifestyle constraints of the players, ii) the timing of familial interaction (i.e., taking photos, sending photos and text, and interaction with the media), and iii) how the timing of this interaction was interpreted, managed and understood by the families. Whilst some of the emergent themes such as anticipation/expectation/disappointment find comparison in other authors' work, such as Taylor and Harpers's [9] notion of reciprocal exchange and ensuing obligations, ultimately and perhaps most notably, we argue the importance of recognising the significance of time in the design of systems which seek to support social connectivity between distributed families.

## THE DESIGN OF COLLAGE

Collage is a multi-location interaction touch screen system, which supports the display of images and text. It was designed with the intention of allowing open and creative forms of sharing and playful interaction between almost all distributed family members; including the very young (3 years plus) and the elderly. Users are able to send data to the Collage Server via a mobile phone (Nokia N80) supplied by the study. The system enables multiple users to upload images and text “anywhere, anytime” [6] to the system. The system allows various interactions with the touch screen including *stopping, moving, enlarging, rotating, co-locating and deleting photos and text*. Thus the touch screens allow users to manipulate the content of the collage, whilst the synchronous link between screens ensures that multiple users can interact with the media almost simultaneously.

### Technology Description

In each family household, we provided a minimum of two mobile phones and installed the following hardware: touch screen display, Windows PC with wireless network card (802.11x), keyboard and mouse (usually hidden), wireless router, and a Collage Flash executable file. Participants would send a MMS (multimedia messaging system) to the project e-mail address. A Java application was programmed to extract image attachments and body text from a POP3 compliant mail server and place these into a MySQL database—these are the pictures and messages sent by the participants. The Collage Flash executable communicated with a Flash Media server and the Apache/PHP HTTP Server. The images and text were read from the database and then served by the Flash server to the executable on the Collage system. All Collage systems received exactly the same content in the same order so that every display matched that on the server. If someone manipulated content in one household, this would be reflected in all of the linked displays in real-time. This architecture also enabled the researchers to run browser-based clients to observe and record activities at a separate location.

Images and text sent from mobile phones to the server would appear disassociated on the touch-screen. This was done with the intention of allowing participants the opportunity to realign significant images and textual content. The images and text (the ‘content’) would then flow down the screen in a continuous ‘waterfall’ effect. This waterfall of media would repeat itself after some time. This period of repetition was dependent upon the amount of content in the system—the more content, the longer the period would be. The display algorithm varied the size and speed at which content displayed according to its age. Older content would appear smaller and flow down the screen at a higher rate, hence appearing as if it was shrinking away to the background over time.

### COLLAGE STUDY

Whilst this paper highlights some of the salient factors of temporality on user experience, the study more broadly

examined intergenerational play and social connectivity. Hence, the overarching research goals were:

- To what extent the sharing and manipulation of images and textual content via the Collage system support ongoing familial interaction
- Whether the Collage system triggers intergenerational playful interaction across a distance
- Whether the Collage system supports a sense of social connectivity amongst distributed family members
- What design implications the system has for future familial prototypes

### Method

We utilized ethnographic field study methods [1] including field observations and open-ended interviews to bring to light the temporal factors which affected and influenced the families’ interactions with the system. In addition, we incorporated the use of log data from the server to supplement participant data. The combinations of both quantitative and qualitative data provided insight into the temporal factors which mediated participant experience of social connectedness and the extent to which the temporal affordances of the technology influenced the sharing of digital family images.

### Selecting Participants

The recruitment criteria for this study were:

- Three Victorian-based families, each with at least two distributed familial homes (one for Grandparents, one for parents and child/ren)
- All households must have broadband Internet connection.
- Preferably all adult members of the households should have some mobile phone experience.

### THE SIGNIFICANCE OF TIME FOR FAMILIAL INTERACTION

As Collage was embedded in the everyday lives of the families, activities that centered on its use must be read within the context of the families’ broader *temporal patterns*. In the following section we describe the significance of ‘time’ in more detail and explore how it mediated familial’ interactions via Collage.

### Lifestyle Constraints

We found that each generation has its own communication priorities and rhythms, which were partially influenced by lifestyle constraints. While there was a genuine desire to create more time for family oriented activities, families’ lifestyles often made this difficult. Despite our assumption that Grandparents, as retirees, would have ample spare time, this was not the case. These GP’s were primarily professionals and active retirees, who engaged in a combination of part-time work, volunteer work and a range of social activities. Furthermore, we found that the types of interactions that individual members had with other family members depended upon the degree to which that time was

structured or unstructured. In most instances, families were bound by tight time schedules, dictated primarily by parental working patterns and children's activities such as kindergarten, school, sports and recreational activities such as Scouts. While Grandparents were busy their lives were less structured: one GP stated "retirement means you don't have to live the structured life (...) It can be flexible, you're not as tied in."

How the families interweaved their different schedules had a significant effect upon the amount of time they spent together, and the kinds of activities they did together. Co-located events were usually limited to regular activities (e.g. dinner at GP's) or special events (e.g. religious holidays and birthdays). Some 'traditional' events such as baking Christmas cookies were pushed aside if there was insufficient time.

### **Timing of Interaction**

Each household developed different rhythms and patterns of interaction, with using both the mobile phone cameras and Collage. Some of these are cited below.

#### *Taking photos*

The families' photo-taking practices revealed a number of consistencies, however, the way in which participants interpreted and responded to these various factors were not only individual but also situational and context driven. In general, all participants, regardless of age, were influenced by their individual and familial schedules. The grandparents took photos during specific moments in the day, such as when going on a particular outing or while at a dinner party. While this was also true for the parents, what they photographed and when was often determined by the children's activities. School concerts, sporting events and the like were primary targets for photo opportunities.

Whilst the children were often the subject of the images, they were constrained by their parents in terms of when and where they could use the camera phone. They were usually limited to after school hours and weekends, when they would not be distracted from other commitments. There were some exceptions to this. For example, when the oldest boy in FamilyB went away on a Scout camp he was allowed to take the phone with him. Similarly, the two girls in FamilyC2 were given more freedom with the phones during a family trip to Vietnam. Surprisingly, children as young as four were taking pictures independently of their parents.

#### *Sending photos and text*

Whilst the phones afforded immediate communication of images and text, there were a number of technical and familial factors which mediated this. This varied from poor reception to the reliance of particular family members to send images to Collage, and in one instance the failure of global roaming during FamilyC's trip to Vietnam. In all these instances, participants had to wait for a later opportunity to send images or text to Collage. For Family C, this meant waiting till they returned to Australia before

they could send any images. Similarly, one grandmother took photos at her home and had to wait till she was in a neighbouring town centre before she had sufficient reception to send her images/text.

Technical issues were not necessarily the only reason for the disparities between taking and sending images. It was not unusual for one family member to become the designated sender, as sending photos by phone required a number of steps. In most instances it was the mother or wife although in both FamilyB and C the older siblings also sent images for the younger ones.

Participants also took advantage of the phones immediacy, for example, they reported using the phone to provide up to date and immediate coverage of events as they happened, or as one participant stated, the phones provided "real-time photos". In one instance, the mother from FamilyB used the immediacy of the system to initiate a playful game with other members of the household. By sending images from one room in the house to the screen, which was situated in another room, she delightfully confused the other members, who did not realise that what they were watching was happening contiguously in the other room.

#### *Timing of Interaction*

In general, participants developed patterns around their interactions with the screen, this varied from synchronous to asynchronous. Synchronous interaction generally took place between two or more people. Most of these types of activities happened when participants suspected others would be near the screen. Participants usually developed a tacit knowledge about when another family member would be available to interact. For example, the grandfather in FamilyB knew that his grandson (aged 4) was available early in the morning before kindergarten, and both grandsons were usually at home after school around 4pm. Likewise, in FamilyC, the two fathers (adult brothers) would interact via Collage around 11pm, when the rest of household had gone to sleep.

Asynchronous interaction generally took place between an individual and the screen. We saw that this type of interaction was greatly influenced by other activities going on around the Collage screen. These contextual factors had a large impression on participant responses and reactions to the digital content. For example, the grandmother from FamilyC commented that she often checked to see if new images arrived in the morning and again in the afternoon, spending up to 15min at a time trawling through images. She also noted that if she was watching TV, she would notice out of the corner of her eye new images when they arrived. Almost all the Families commented on the relationship between performing another activity close to the screen and having serendipitous encounters with image or text.

### **Anticipation/ Expectation / Disappointment**

Participant experience of Collage was, to a degree, contingent upon their expectations of when new digital

content would arrive, and when future interactions with the touch screen would take place. The actual timing of these factors generated both curiosity and disappointment in participants. For example, the mother from FamilyB sent a text message to Collage that read, "It pays to keep the old stuff". Later that day the mother sent an image of her youngest son in a Scarecrow outfit, which her mother (GMB) had made for her as a child. This image allowed other family members to make sense of her otherwise cryptic message. In this sense, the mother was able to create anticipation around the text. When the image arrived it challenged and surprised the Grandparents expectations about its potential meaning.

However, in another example, we are able to see how a delay in timing can also create disappointment. When FamilyC2 went to Vietnam there was a general expectation that family members back in Australia would be able to see images on Collage as they were taken. While we had installed global roaming on FamilyC2's phones for the purpose of the trip, it failed to work. This was very disappointing for the families back home who had to wait two weeks to see the photos. When the photos finally arrived on collage they created a great sense of excitement once again. In another example, Grandfather A and his grandson (aged 9) had chess boards set up in their homes. They took photographs of their chess moves and sent them to Collage in a clever game of virtual chess. When the grandson became bored with the game and no longer responded to the Grandfathers images the grandfather was at first confused, then disappointed and upset that the game had been abandoned.

Whether the image/text generates the anticipation as in the first example, or the users expectations heightens the anticipation for the image/text, the time it takes for the users to resolve the ambiguity may affect their overall experience of Collage. One Grandfather reported that he "felt depleted" when the system went down and he was unsure when he could re-engage with it again.

#### **Disruption of family life**

A major factor that affected the use of Collage was the location of the display screen within the home and the impact this had on the families' temporal rhythms. Households that had a screen in the main living space of the home often described instances where it was disruptive to the usual family rhythms. For example, FamilyB1 and FamilyC1 both had the screen in the dining room, which created complications around meal times. In FamilyB1 the husband (who was not participating) complained that his wife was distracted from making his dinner. The mother of family C1 described the difficulty of having young children distracted from their meals by images on the Collage screen. In particular she felt that some of the images of the grandparents' social activities invaded her own, as well as her family's space. Eventually, she started turning the display off at certain times of the day and dictating specific times that the children could play with it. Overall however,

families welcomed the opportunity to interact with distributed family members via Collage, and dinner time was seen as an ideal time to interact and play, as families are located near their touch screens. It is not coincidental that this interaction mimics traditional familial interaction, such as sharing the day's events, around the dinner table.

#### **Implications for Design**

We believe that designers of technology intending to support interaction between distributed familial members should be cognisant of the significance of temporal patterns identified in this paper. In particular they should:

1. *Recognise familial temporal interactions.* Social interactive technologies in the home will be used opportunistically, when families are able to fit them into busy schedules.
2. *Recognise the significance of time and location for capturing and sending digital images, as well as their role in mediating user expectations.* Participant expectations concerning when something will arrive, the location of the participant at the time the image is sent, technical difficulties with sending and receiving images and familial interpretation of the image all impact on their significance for familial members.
3. *Recognise that the disruption of familial temporal patterns are not necessarily a negative thing.* Challenge participants to seek contact in ways they would not usually e.g., most families would not usually answer the phone at dinnertime, however some families were happy to interact and play with the system while eating dinner.
4. *Recognise that disjunctions in sending and receiving digital content can initiate new and playful interactions between family members.* Social technologies, such as Collage, should enable users to resolve uncertainties – time, identity, context - as a course of their interactions with the system and other users.

#### **CONCLUSION**

In this paper we have introduced a multi-location interactive touch screen based system (Collage), which enables the sharing of digital images and textual content between distributed intergenerational familial homes. Through an examination of lifestyle constraints, timing of interaction with both mobile phones and touch screens, and a discussion of how the technologies were mediated into the familial routines, we have highlighted the significance of time as a factor in the design of familial social connectivity systems for distributed families.

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