Chapter 8
Inter-Family Messaging with Domestic Media Spaces

Tejinder K. Judge, Carman Neustaedter and Steve Harrison

Abstract Many family members have a need to stay connected with their loved ones when they are separated by distance. Technologies such as the phone or email help achieve this to some extent, but, many people still feel out of touch with their loved ones. We designed two domestic media spaces—The Family Window and Family Portals—to help distributed family members connect with remote families' homes using 'always-on' video connections. In addition to this, both systems allowed family members to interact using handwritten messaging. Our chapter focuses on this latter functionality to explore the ways in which family members made use of the inter-family messaging features found within our domestic media space systems. Here we discuss both synchronous and asynchronous messaging and the nuances of public *vs*. private messaging between households. We conclude with a discussion of implications for inter-family messaging systems.

T. K. Judge (✉)
Google Inc.,
Mountain View, CA, USA
e-mail: tkjudge@google.com

C. Neustaedter
School of Interactive Arts and Technology,
Simon Fraser University,
102 Avenue 250-13450, V3T 0A3, Surrey, BC, Canada
e-mail: carman_neustaedter@sfu.ca

S. Harrison
Department of Computer Science and School of Visual Arts,
Center for Human-Computer Interaction,
Virginia Polytechnic Institute and State University,
2202 Kraft Drive, Blacksburg, VA 24060, USA
e-mail: srh@vt.edu

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Introduction

Many families and loved ones who are separated by distance try to remain connected and aware of each others' lives in order to feel closer to one another. This includes sharing and learning about one's activities, locations, and status (e.g., health) (Neustaedter et al. 2006; Romero et al. 2007; Tee et al. 2009). For example, parents may want to know about the well-being of their adult children who have 'left home' to live independently or start their own families. Similarly, grandparents often want to learn about their grandchildren as they grow up and know what type of extra curricular activities they are participating in, how their schooling is going, etc. This is elaborated on in Moffatt, David, and Baecker's chapter on connecting grandparents and grandchildren. In addition to the sharing of information, people also typically still want to participate in family gatherings such as holiday get-togethers, birthday parties, and other social gatherings. However, such family gatherings are easily missed unless one is able to travel.

Families use a variety of technologies to stay connected with their loved ones over distance. The phone allows family members to synchronously communicate and discuss each other's lives and happenings. Email supports the asynchronous sharing of information. Instant messaging affords both synchronous and asynchronous communication depending on how family members utilize the technology. While all are beneficial technologies, none allow family members to actually see each other, akin to the way they might in face-to-face situations. The act of being able to see another family member has been shown to provide additional feelings of closeness (Neustaedter et al. 2006; Tee et al. 2009; Ames et al. 2010; Judge and Neustaedter 2010; Kirk et al. 2010).

It is for this reason that many families have begun to adopt off-the-shelf video conferencing, or 'video chat' systems, such as Skype, Apple FaceTime, and Google Chat, to stay connected with their remote family members. Yet the challenge is that most are designed to be used in a manner similar to the telephone where one calls another person for a fixed time period. Such design and implied usage makes video calls limited when it comes to sharing longer activities and time periods with remote family members. For these reasons, our research has explored the design of video chat systems where the video link can be easily left on for an extended period of time, akin to media spaces originally designed for the workplace in the 1980s and 1990s (Harrison 2009). We call these domestic media spaces.

First, we designed a *dyadic* domestic media space called THE FAMILY WINDOW that provided an always-on video connection between *two* households using a situated display (Judge et al. 2010). The Family Window also provided a messaging feature where families could leave messages for each other by handwriting on top of the video display. Our field deployment showed that families enjoyed being able to see their remote family members on a daily basis and the messaging feature allowed them to share additional information including greetings, comments, and heartfelt messages. Second, and building on this research, we designed a *multi*-family media space called FAMILY PORTALS that provided a video link between *three* families'

homes in addition to *both* private and public messaging capabilities (Judge et al. 2011). Again, our field deployment showed success, though with an increased set of relationships being supported by the system, additional privacy concerns arose. We also saw families adopt distinct messaging practices in terms of when they chose to send messages to each household in a private fashion and when they would publicly send messages to both.

Our focus in this chapter is on describing the ways in which family members adopted and used the messaging features found in both the Family Window and Family Portals as it relates to asynchronous usage, synchronous usage, and private vs. public messaging. For more results on the ways in which family members used the video connection within these systems, we refer readers to our conference papers on the topic (Judge et al. 2010, 2011). We begin the chapter by describing related on work on intra and inter-family messaging, which compliments Schatorje and Markopoulos's earlier chapter in this book on Family Circles. Second, we outline the Family Window's design and our findings on the ways in which families adopted and appropriated its messaging capabilities. This highlights the value of providing messaging capabilities within an awareness system focused around a video connection. Next, we outline the design of Family Portals where we describe the effects of a having a triad of families use the media space for inter-family messaging and the public and private nature of messages. We conclude the chapter by discussing the implications of these practices for the design of future inter-family messaging systems.

Related Work

First, several research prototypes have been designed to support situated *intra*-family messaging. That is, messaging between family members who live in the same residence. TxtBoard was a messaging system that allowed family members to send messages via the short messaging service (SMS) between a situated display in the home and family members' mobile phones (O'Hara et al. 2005). In a field trial, family members used the system to share messages about their location, activity, and status. Following this, Sellen et al. (2006) created HomeNote, which built on TxtBoard's messaging capabilities and added the ability to leave handwritten messages on the home display. Here field deployments with families found the system was used extensively for sharing awareness information, providing social 'touches' for others, and storing information, amongst a variety of other uses. Overall, the usefulness of HomeNote depended on the family and their specific needs. StickySpots was similar in design to HomeNote, but focused on the importance of location when it comes to the placement of messages within the home (Elliot et al. 2007). With StickySpots, family members could leave messages on any number of interconnected displays placed throughout the home, where the placement of a message would provide additional meaning for it. For example, messages meant for parents could be placed on a display situated in a location that they usually looked at when

arriving home from work. Similarly, messages meant for children in a family could be placed on displays near their rooms. More recently, we have seen research that moves away from the 'written messaging' paradigm of the above systems. Family Circles allows family members to record audio messages on round messaging tokens, which can then be placed in locations throughout the home for playback (Schatorje and Markopoulos's chapter). This, again, allows contextual information to be associated with the messages. We refer readers to Schatorje and Markopoulos's earlier chapter in this book to learn more about the system and its design.

Several research prototypes have also been designed to support situated *inter*-family messaging between homes. Here we are referring to messaging between one or more households where there may be more than one distinct family unit involved. This is akin to the way that the Family Window supports family messaging. The earliest system, CommuteBoard (Hindus et al. 2001), provided a shared whiteboard for connecting two households. This system allowed carpoolers to leave handwritten messages for one another to coordinate rides. Deployments found that the use of colored digital ink and the informal nature of handwritten notes caused a form of playfulness to appear. However, the legibility of handwriting and limited writing spaces caused usability issues for family members. In their evaluation of SPARCs, a photo and calendar-sharing prototype, Tee et al. (2009) also deployed MessyBoard (Fass et al. 2001) as a comparison to SPARCs. While not originally designed for families, for this evaluation, MessyBoard provided families with a shared messaging board that allowed typed notes to be left for remote family members. The field deployment found that people enjoyed being able to asynchronously leave messages for the remote household (Tee et al. 2009).

While the above systems supported dyadic family connections, the related research also provides examples of inter-family messaging systems that connect multiple households together. Here we are referring to messaging between more than two families, akin to the way that Family Portals supports family messaging. First, messageProbe (Hutchinson et al. 2003) allowed multiple families to leave handwritten messages on "Post-It" notes placed on a canvas shared by all households using the system. In this way, families could see *all* messages posted to the system, but there was no means to send private messages intended for only one household. Second, Wayve (Lindley et al. 2010) allowed families to leave handwritten notes for one another on interconnected messaging appliances, one in each household. Messages could also be sent from Wayve to email accounts or mobile phones and vice versa. In this way, sending from the device could be private if directed to one person's email or phone. Yet all email and text messages sent to the messaging appliance were inherently public to all families. Thus, there was no way to send a private message to a family's situated display. When evaluating Wayve, Lindley et al. (2010) found that most messages were public messages sent between families' Wayve devices, with fewer messages sent privately to individuals via email/phones. What remains unknown is whether or not such behavior would stay consistent if the situated messaging appliances could receive private messages.

Our work builds on the existing research in two ways that form the focus for remainder of the chapter. First, we explore the usage of inter-family messaging

systems that are coupled with video media spaces by looking at the design and field trials of both the Family Window and Family Portals. Second, we directly explore families' behaviors when they have the ability to send both private and public messages to displays situated in other families' homes as was possible with Family Portals.

Situated Messaging in a Dyadic Media Space

The Family Window was designed to be a *dyadic* media space that connected two homes with always-on video. Figure 8.1 shows the system being used by a set of grandparents, their children, and grandchildren. The video link from the grandparents' home (the remote view) is shown spanning the majority of the display and a feedback view of the children/grandchildren's home (the local view) is shown in the bottom left corner of the screen (Fig. 8.1). The system runs on a dedicated display such as a tablet PC or digital frame in order to act as an information appliance, as shown in Fig. 8.2. In addition to the video capabilities, families are also able to leave handwritten messages for each by writing on top of the video display using either a stylus or finger. For example, the red handwriting in Fig. 8.1 is a message written at the children/grandchildren's house and the yellow handwriting is the response written at the grandparent's home. Family members can pick and choose ink colors as well as erase content. These writing capabilities build on ideas from workplace media spaces (e.g., Tang and Minneman 1990, 1991). A video of the Family Window and its interaction can be found in Neustaedter et al. (2010).

In order to understand how families would adopt and use the Family Window, we conducted a set of field trials with three family pairs. Two pairs used the system for a period of 5 weeks and one pair used it for 8 months as a part of its autobiographical design (Judge et al. 2010):

Sister Families The first pair connected the families of two sisters, which included connecting two parents and their 18-month-old son with the wife's sister and her long-term male companion. The two households lived a 2-hour drive apart.

Daughter-Parents-Grandchildren Families The second pair connected the families of a daughter and her mother, which included connecting the daughter, her husband, and their 2-year-old son with the child's grandparents. The two households lived in the same time zone, but were a 21-hour drive apart.

Son-Parents-Grandchildren Families The third pair connected the families of a son and his parents. This included connecting the son's wife and their two children, aged 3 years and 8 months (at study completion), with the children's grandparents. The two households were separated by three time zones across North America (coast-to-coast).

We conducted semi-structured contextual interviews with the families throughout their usage and also sent emails and phoned between interviews to ensure

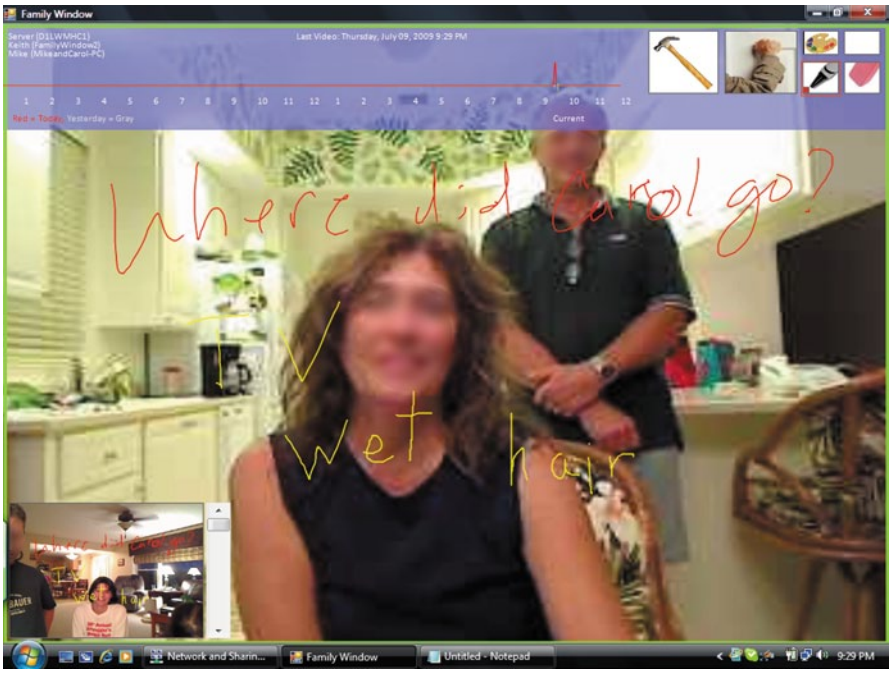

Fig. 8.1 The Family Window's user interface

Fig. 8.2 The Family Window running in a dedicated display in a family's living room

families were not having technical difficulties. We used open, axial, and selective coding to analyze our data and generated codes that reflected a variety of usage patterns (Strauss and Corbin 1998).

Interacting Through the Family Window

The always-on video link in the Family Window provided the families with many opportunities to see what was happening in the remote families' homes, which made them feel closer as a result. Families also used the Family Window as a communication tool for interacting with their remote family members.

First, families often coupled their use of the Family Window with the phone as our design did not provide an audio link (because of assumed privacy risks associated with long-term audio connections). The Family Window would provide the video link to see family members, gesture, or show items of interest and the phone supported the voice conversation. While beneficial, phone calls only sufficed for situations where family members wanted to have longer conversations. In situations where they wanted to simply say a quick 'hi', they relied on the messaging capabilities of the Family Window. In these situations, phoning the other home would have suggested the need for a longer conversation than was necessary. Thus, the Family Window provided family members with a unique opportunity to still exchange information but not be committed to a long conversation. Here we saw families leave a large number of handwritten messages as a form of asynchronous communication. Messages often began with a simple 'good morning' at the beginning of the day and then evolved into more detailed discussions with messages left at various points in reply to one another. Participants told us that seeing these messages in the context of the remote family's video made them special because it was a dedicated communication portal with the remote family. Families also said that these messages required less effort to write than their normal exchanges of email.

> It is nice to come home or wake up to see a message from [my sister]. A simple message like 'have a nice day' is all I need to know that she is thinking of me.—Sister 1 in the Sisters Pair

We also saw instances of synchronous communication occur where families would leave a series of messages one after another in a turn-taking fashion over a series of several minutes. In essence, they had turned the Family Window's messaging canvas into a handwritten 'chat window.' Such chat sessions often progressed slowly (handwriting is often slow), though family members commented that despite the lack of speed, being able to see the remote family member's handwriting presented enhanced feelings of closeness.

In several instances, we learned that the Family Window's messaging capabilities led to an interesting routine for the 2-year-old grandson and his grandmother in the second family pair. The grandson would have exchanges with his grandmother where she would write alphabet letters on the Family Window for him, draw shapes, or hold up different colors to try to teach him new things. In turn, he would draw

pictures for her. This routine became so important to the grandson that he would run to the Family Window each day after returning home from daycare, scribble a message on it, and kiss the video of his grandmother's face. If his grandmother was not around, his father would call her house and tell her that her grandson was looking for her. This further illustrates the value that families found in having messaging coupled with the video link.

Situated Messaging in a Multifamily Media Space

Following from our Family Window research, we wanted to understand how media spaces and family messaging would extend beyond a dyad to connect multiple families. We knew from prior research that people like to stay aware of the lives of their remote family members, however, it is not the case that people share the same information with all of their remote family members (Neustaedter et al. 2006; Tee et al. 2009). Different people receive different information and at different frequencies (Neustaedter et al. 2006). For example, an adult child might talk with her mother on a daily basis on the phone, telling her about major happenings each day. On the other hand, the same person might only talk with her grandmother once a month. The information shared in this case will likely be more superficial and focus on specific things like how her children are doing and activities they are involved in at school (Neustaedter et al. 2006). What is unclear is how these findings extend to the use of new situated messaging systems for families. That is, if family members are able to send different information to different families, will they do so and in what ways?

As a first step to answering this question, we designed a new media space called Family Portals that built on the Family Window's design to connect three households together instead of just two (Judge et al. 2011). One could imagine extending this design further to support *n*-connections, though such extensions are certainly non-trivial (e.g., networking complexities, visualization challenges, privacy issues). Figure 8.3 shows the user interface for Family Portals, which again ran in a tablet display to prototype the idea of a dedicated information appliance. The system provides always-on video feeds between three families' homes, in addition to both public and private messaging features.

Private Messaging The left side of the screen in Fig. 8.3 shows two Targeted Portals (top and bottom), one for each family that a local family is connecting to. The portals show the video feed from the remote home and local family members can leave handwritten messages for specific families by writing on top of their video feed using either a stylus or finger. Only the target family sees the writing; thus, it is a private writing space for the two families. A notification appears at the bottom of the display when a new message is written. Users can pick ink colors and erase writing using the icons on the left side of the Portal.

Public Messaging The right side of Fig. 8.3 shows a Shared Portal. Family members can leave handwritten messages here, which show up for *all* families. Thus,

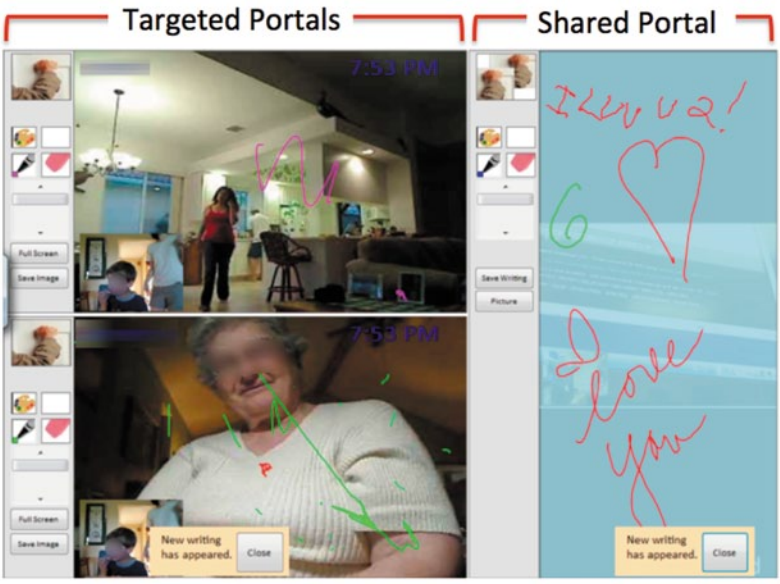

Fig. 8.3 The user interface for Family Portals

it is a public messaging board and offers the same basic functionality as messageProbe (Hutchinson et al. 2003) and Wayve (Lindley et al. 2010). Ink options can be selected to the left of the Shared Portal along with the ability to choose a background picture, which is seen by all families. This picture is overlaid with a semi-transparent blue rectangle so writing is more easily visible.

We conducted a field study with Family Portals in order to learn how families would use its video and messaging features. We recruited six families—two triads—from the USA where all six families used Family Portals within their homes over a period of 8 weeks, though technical issues caused the system to not work during the first 2 weeks. Family compositions are shown in Table 8.1 along with their locations and the pseudonyms we use to refer to the families throughout our results. Triad 1 was composed of women from three generations (daughter, mother, grandmother) and their family members. Triad 2 was composed of the families of two sisters and their mother. All families contained children of varying ages along with partners.

We again conducted semi-structured contextual interviews with the families throughout the course of the field trials. Usage of features was logged and screenshots of writing on Family Portals were also captured by the system. We used open, axial, and selective coding to analyze the interviews (Strauss and Corbin 1998). Next we describe our study results related to family messaging.

Table 8.1 Field study families for Family Portals

	Family name	Household composition	Location
Triad 1	Daughter family	2 parents in 30s, 1 son aged 3	City1, New York
	Daughter parents family	2 parents in 50s	City2, New York
	Daughter grandparents family	2 grandparents in 80s	City3, Florida
Triad 2	Younger sister family	2 parents in 30s, 1 son aged 3	City1, New York
	Sister mother	1 parent in 50s	City4, New York
	Older sister family	2 parents in 30s, son aged 10, son aged 6, daughter aged 1	City4, New York

Public Asynchronous Messaging in the Public Space

The basic usage of the Shared Portal or shared whiteboard was to write messages, questions and notes intended for *all* families. We found this pattern of use among families in both triads. This is similar to messaging practices found with messageProbe (Hutchinson et al. 2003) and the Family Window (Judge et al. 2010). The most common messages were greetings between families such as 'good morning' or 'good night.' Figure 8.4 shows a goodnight message left by the wife in the Daughter Parents family for both the families she was connected to.

Families also used the Shared Portal to share information about where family members were going and what they were doing that day. For example, the husband in the Daughter family wrote one evening,

> [Wife] + [son] should be home at 5:30. I'm leaving to teach tonight ☺.—Message written on the shared whiteboard by Husband in Daughter family

Another common use of the Shared Portal was for families to share information about food they were having for dinner and playfully compared each other's menus. For example the wife from the Daughter family wrote one night, *"What's for dinner? Ckn nug [chicken nuggets] & tater tots here…"* and her parents responded, *"M&D [Mum and Dad] having wine."*

During the first few weeks of usage, families faced some confusion over the author of messages on the Shared Portal. For example, it was difficult for families to determine the author of a message if it was written in all capital letters or if the content of the message was general to all families. Some family members left their initials at the end of a message, but over time, this became unnecessary as families learned to recognize each other's handwriting or used the context of the message and their shared common ground to determine the author.

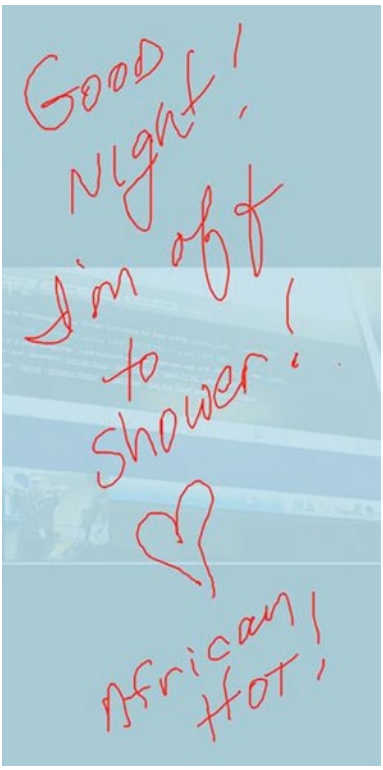

Fig. 8.4 Good night greeting from wife in Daughter Parents family

Private Asynchronous Messaging in the Public Space

We also found that families used the Shared Portal for messages intended for a *specific* family, even though the third family could see them. This pattern of use was mainly found in Triad 2. For instance, Sister Mother lived close to Older Sister's family and met them 3–4 times a week. She and Older Sister would use the Shared Portal to schedule their meetings. They did so without worrying about Younger Sister feeling excluded because Younger Sister knew that her mother frequently visited her sister's family. Figure 8.5 shows one such message written by Sister Mother for Older Sister's family about meeting them at 6 pm one night.

In such cases, families reported that they preferred to write on the Shared Portal as opposed to the Targeted Portal, as they felt messages on the Targeted Portal may be hard to read due to being on top of the video. This suggests a usability issue in terms of readability when multiple information sources (e.g., video *and* writing) use the same region of the display. Yet families also said that in these situations, they did not mind that the third family could see the message on the Shared Portal.

Fig. 8.5 Message to Older Sister's family from Sister Mother

Synchronous Messaging in the Public Space

Although we expected that the writing features of Family Portals would mostly be used for asynchronous messaging, we found that families used Family Portals for synchronous interaction akin to 'chat sessions.' This was similar to the use of the Family Window only the chat sessions with Family Portals occurred over larger time spans (e.g., 20–30 min). We believe this difference was idiosyncratic to our participants as opposed to an effect of the difference in systems. Figure 8.6 shows an example from Triad 1 where the wife in the Daughter Parents family is chatting with her mother using the Shared Portal. Most chats were between just two households because it wasn't often that members from all three families would be serendipitously present in front of their Family Portals at the same moment.

Interestingly, families used the Shared Portal and not the Targeted Portal for these dyadic communication episodes. Again, they found it easier to read messages not written on top of the video, but they also said that they were typically chatting about general topics such as family activities, an update after a doctor's visit, etc. In these situations, families were also not concerned about the third family 'walking in' and reading their chats. They told us that if a member from the third family became available at a certain point, they could easily join the conversation by

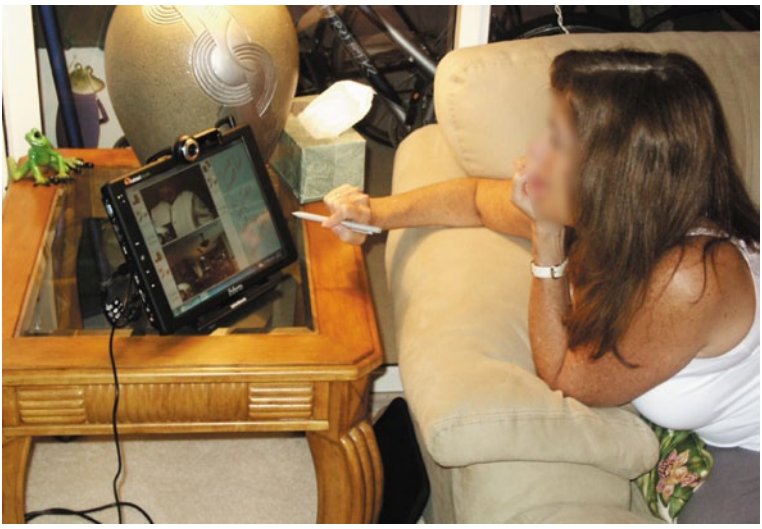

Fig. 8.6 Wife in the Daughter Parents family engaged in synchronous messaging or "chatting" with her mother

reading the previous messages. Families also preferred using the Shared Portal for chats because it allowed them to see each other while writing. Being able to see each other augmented the experience and they did not want to lose this by writing on each other's video feed.

If all three families were present for a synchronous chat, they naturally used the Shared Portal. Participants did not tell us about any situations where Targeted Portals were used as backchannels between only two families when all three were conversing in the Shared Portal.

Confidential Messaging in the Private Space

As one might expect, families did use the Targeted Portals for private messages and discussions that they did not want the third family to know about. For instance, Older Sister and Younger Sister used the Targeted Portal to discuss their suspicion that their mother was not following the diet her doctor recommended. In this case, both sisters would be mortified if their mother would have accidentally seen this discussion.

It was easy for family members to decide where such messages should go given the nature of the information. The readability difficulties of writing on top of the video feed were much less of a concern than the confidential information contained in the messages. In some ways, readability challenges provided a psychological 'cloak,' which visually suggested that the messages were private due to their (sometimes lack of) legibility.

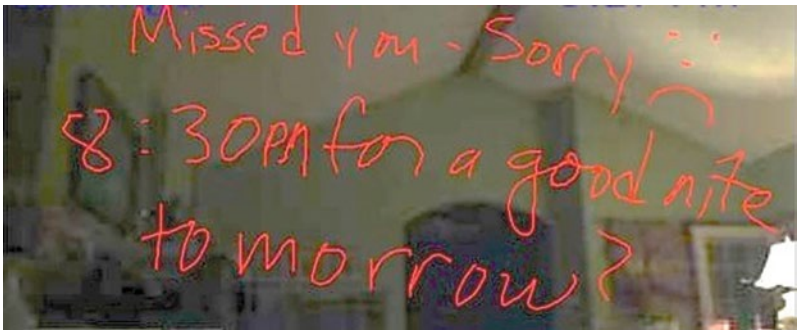

Fig. 8.7 Message on Targeted Portal from wife in Daughter family to her grandmother

Selective Messaging in the Private Space

Families also used the Targeted Portal for situations where they wanted to leave a message for one family, but knew it did *not* involve the third family. They did this to simplify communication and to ensure that the family the message was intended for would easily know there was a message for them. For example, the wife in the Daughter family wrote the note shown in Fig. 8.7 on her grandmother's Targeted Portal. While there was nothing confidential in this message, it was written on the Targeted Portal because it did not involve the third family and was intended *specifically* for the grandmother. Thus, families recognized this and, whether they realized it or not, reduced 'information clutter' for other families.

Families also used the Targeted Portal for topics they had in common with one household and not the other. The shared common ground between the two households made it easy to send these messages and not feel badly about leaving out the third household.

> When I have a question for [daughter] it is easier to write it in her window [Targeted Portal] instead of writing it on the chalkboard [Shared Portal] and having to explain it to my mother.—Interview with wife in Daughter Parents family

Both of these cases were found despite the fact that messages written in the Targeted Portals may be harder to read on top of the video feed. This pattern of use was mainly found in Triad 1. Both the Daughter family and Daughter Parents family made a conscious effort to reduce information clutter for the grandparents to prevent any confusion that might results in them shying away from the technology. Thus, the need to reduce information clutter for families not involved in a conversation superseded the usability issue of writing on top of the video feed.

Discussion and Conclusions

In this chapter, we have explored inter-family messaging when it is coupled with an always-on video link provided by a media space. This has included discussions of the design and evaluation of two such systems, The Family Window and Family Portals. In both cases, we found that families leveraged the messaging features of the system in order to support both synchronous and asynchronous communication. This also revealed the need for families to exchange short messages without being committed to long conversations (e.g., on the phone). Because messages were placed in the context of the remote family—their video link—they had additional meaning and were uniquely associated with that family. In addition to this, we also found challenges with both systems in terms of how they presented their messaging capabilities.

First, families sometimes faced challenges in identifying who was writing messages. This was particularly problematic with the Family Portals because there were multiple households, and multiple family members within them, that might be using the system. Although families were able to resolve this issue over time by learning each other's handwriting and using the context of the message to determine the author, this problem will be more prominent in multiparty messaging system connecting more than three families. This suggests mechanisms that allow families to identify which family members and/or households left which messages. For example, systems could identify different families with different colors.

Second, readability was an important factor for families when choosing where to leave messages. Written messages on top of the video link could sometimes cause readability issues, but this depended on what was being shown in the video feed. This affected where family members wanted to leave messages on the display. Writing on top of the video feed also prevented family members from seeing each other while chatting. Although families are typically not able to see each other while chatting using other tools (e.g., instant messaging), the option to *see* the other person while communicating with them was greatly valued by families.

Third, confidentiality and reducing information clutter were also factors that families considered when choosing where to leave messages. This was seen with Family Portals because of the introduction of a third family. Although writing on the video feed in the Targeted Portal caused readability issues, at times families' needs to send confidential messages superseded this issue. Similarly, the need to selectively target content at one family and not both to reduce information clutter and due to shared common ground, was also more important than readability issues.

Fourth, and more generally, it is clear that families find value in the inclusion of *both* public and private messaging within a family messaging system. This is evidenced by the examples from the Family Portals study and also the fact that family members recognized that even though some content might be directed at one family, it could also be interesting for another family to see. In these situations, families chose a public space for writing, despite the targeted nature of the message. This illustrates that families *are* thinking about who would likely want to see their

messages beyond the intended recipient using their judgments to decide where to place messages.

Lastly, our work is certainly not without its limitations. Both systems were used by only a small number of families. While typical for domestic field trials because of their complexity, this does not allow us to more broadly understand how different family compositions and relationships will make use of family messaging systems. Despite this, it is likely the case that families will still value the ability to send both private and public messages, and will continue to value the linkage between video connections showing the remote family and messaging features; however, the specific usage of these features may differ with additional families.

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References

Ames, M.G., Go, J., Kaye, J.J., Spasojevic, M. (2010). Making love in the network closet: the benefits and work of family videochat. *ACM Conference on Computer Supported Cooperative Work 2010* (pp. 145–154). New York: ACM.

Elliot, K., Neustaedter, C., Greenberg, S. (2007). StickySpots: using location to embed technology in the social practices of the home. *ACM Conference on Tangible, Embodied and Embedded Interaction*. New York: ACM.

Fass, A., Forlizzi, J., Pausch, R. (2001). MessyDesk and MessyBoard: two designs inspired by the goal of improving human memory. *ACM Conference on Designing Interactive Systems 2001* (pp. 303–311). New York: ACM.

Harrison, S. (2009). *Media Space: 20+ Years of Mediated Life*. London: Springer.

Hindus, D., Mainwaring, S., Leduc, N., Hagstr, A., Bayley, O. (2001). Casablanca: designing social communication devices for the home. *ACM SIGCHI Conference on Human Factors in Computing Systems 2001* (pp. 325–332). New York: ACM.

Hutchinson, H., Mackay, W., Westerlund, B., Bederson, B., Druin, A., Plaisant, C., Beaudouin-Lafon, M., Conversy, S., Evans, H., Hansen, H., Roussel, N., Eiderback, B. (2003). Technology probes: inspiring design for and with families. *ACM SIGCHI Conference on Human Factors in Computing Systems 2001* (pp. 17–24).

Judge, T. K., & Neustaedter, C. (2010). Sharing conversation and sharing life: video conferencing in the home. *ACM SIGCHI Conference on Human Factors in Computing Systems 2010* (pp. 655–658). New York: ACM.

Judge, T. K., Neustaedter, C., Kurtz, A. (2010). The family window: the design and evaluation of a domestic media space. *ACM SIGCHI Conference on Human Factors in Computing Systems 2010* (pp. 2361–2370). New York: ACM.

Judge, T. K., Neustaedter, C., Harrison, S., & Blose, A. (2011). Family portals: Connecting families through a multifamily media space. *ACM SIGCHI Conference on Human Factors in Computing Systems 2011* (pp. 1205–1214). New York: ACM.

Kirk, D.S., Sellen, A., Cao, X. (2010). Home video communication: mediating 'closeness'. *ACM Conference on Computer Supported Cooperative Work 2010* (pp. 135–144). New York: ACM.

Lindley, S., Harper, R., Sellen, A. (2010). Designing a technological playground: a field study of the emergence of play in household messaging. *ACM SIGCHI Conference on Human Factors in Computing Systems 2010* (pp. 2351–2360). New York: ACM.

Neustaedter, C., Elliot, K., Greenberg, S. (2006). Interpersonal awareness in the domestic realm. *Australia Conference on Computer-Human Interaction (OzChi) 2006* (pp. 15–22). New York: ACM.

Neustaedter, C., Judge, T., Kurtz, A., Fedorovskaya, E. (2010). The family window: connecting families over distance with a domestic media space. *Video Proceedings of the Conference on Computer Supported Cooperative Work (CSCW 2010)*. New York: ACM.

O'Hara, K., Harper, R., Unger, A., Wilkes, J., Sharpe, B., Jansen, M. (2005). TxtBoard: from text-to-person to text-to-home. *Proceedings of the Conference on Computer-Human Interaction (CHI 2005), Extended Abstracts*. New York: ACM.

Romero, N., Markopoulos, P., Baren, J., Ruyter, B., Ijsselsteijn, W., Farshchian, B. (2007). Connecting the family with awareness systems. *Personal Ubiquitous Computing, 11*(3), 299–312.

Sellen, A., Harper, R., Eardley, R., Izadi, S, Regan, T., Taylor, A., Wood, K. (2006). Situated messaging for the home. *ACM Conference on Computer Supported Cooperative Work (CSCW 2006)*. New York: ACM.

Strauss, A., & Corbin, J. (1998). *Basics of qualitative research* (2nd ed.). Thousand Oaks: Sage.

Tang, J., & Minneman, S. (1990). VideoDraw: a video interface for collaborative drawing. *ACM SIGCHI Conference on Human Factors in Computing Systems 1990* (pp. 313–320). New York: ACM.

Tang, J., & Minneman, S. (1991). VideoWhiteboard: video shadows to support remote collaboration. *ACM SIGCHI Conference on Human Factors in Computing Systems 1991* (pp. 315–322). New York: ACM.

Tee, K., Brush, A.J., Inkpen, K. (2009). Exploring communication and sharing between extended families. *International Journal of Human-Computer Studies, 67*(2), 128–138.