

# SPARCS: Exploring Sharing Suggestions to Enhance Family Connectedness

**A.J. Bernheim Brush**  
Microsoft Research  
One Microsoft Way  
Redmond, WA 98052  
ajbrush@microsoft.com

**Kori M. Inkpen**  
Microsoft Research  
One Microsoft Way  
Redmond, WA 98052  
kori@microsoft.com

**Kimberly Tee**  
University of Calgary  
2500 University Drive NW  
Calgary, AB T2M 1N4  
tee@cs.ualgary.ca

## ABSTRACT

Staying in touch with extended family members can be a challenge in part because of the time and effort required, even with the help of current technologies. To explore the value of *sharing suggestions* in sparking communication and facilitating sharing between extended families, we iteratively built SPARCS, a prototype that encourages frequent sharing of photos and calendar information between extended families. Results from a five-week field study with 7 pairs of families highlight a number of important features for an ideal sharing system to help families stay connected, including asynchronous chat and easily configurable sharing suggestions.

## Author Keywords

Connectedness, families, sharing, home

## ACM Classification Keywords

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## INTRODUCTION

Information communication technologies such as email, instant messaging, websites for sharing photos and other digital media have broadened the ways that people can stay in touch. Yet, even with the help of current technologies, lack of time and the effort involved can prevent extended family and friends from keeping in touch as often as they would like [15, 21]. For example, sharing photos still requires a considerable amount of time and effort, both for the “photowork” activities [11] that people must do before sharing their photos (e.g., weeding out bad photos, deciding what to share) as well as the authoring costs [6] involved in actually sharing the photos with others (e.g., attaching them to an email, uploading them to a website).

Several research projects have looked at different ways to support people’s need for *connectedness*, defined by Romero et al. [17] as a “positive emotional appraisal,

characterized by a feeling of staying in touch within ongoing social relationships.” Many of these projects have taken the form of awareness displays [e.g., 14, 16, 17] or media spaces [e.g., 8, 9] for the home. In contrast, we were interested in investigating the effects of frequent, asynchronous sharing on connectedness between *extended family members* – people who are related but do not live in the same household. Our focus on frequent sharing differs from the type of episodic communication or sharing that typically occurs after special occasions or events [13, 15]. To make frequent sharing feasible given families’ busy lives, we were also interested in exploring ways to reduce the effort involved in staying in touch.

With these goals, we iteratively developed SPARCS, the ‘Sharing Photos and Relevant Calendar Stuff’ prototype. Every day, SPARCS proposes a *sharing suggestion*: a set of photos to choose from to illustrate past experiences important to the family, and a few upcoming calendar events to inform others about what is going on in the family’s life and to create anticipation for future events. Users can modify this information if desired before SPARCS shares it with others. The design of SPARCS was informed by two user studies we conducted with a total of 28 parents and grandparents.

Once SPARCS was refined into a working version, we had 7 pairs of families use SPARCS in a field study. To better understand families’ reactions to sharing suggestions and SPARCS’s emphasis on sharing a small amount of structured information (a photo and calendar events), we also had participants use MessyBoard, a shared digital bulletin board system that enables more freeform sharing and does not make suggestions [6]. Comparisons participants made between their experiences with the two prototypes demonstrate the potential of sharing suggestions and highlight the importance of persistent asynchronous chat, both features that should be considered by designers and developers of future sharing systems for families.

## SPARCS OVERVIEW

With SPARCS, we focused on supporting frequent sharing of small amounts of information through sharing suggestions. Previous research [10, 12, 17] suggests that a small amount of information (e.g., one photo or a trivial message) may be enough to create a sense of connection

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between people. We chose to share photos and calendar information as they seemed promising for triggering comments and conversations between extended family.

The SPARCS prototype application deployed in the field study, shown in Figure 1, runs on the Windows Vista and XP operating systems. As seen in the main window (Figure 1a), each family has a tab that shows the photo and calendar information that they have most recently shared, which we refer to as a *SPARCS entry*. For example, the Jones family has most recently shared a vacation picture and four events from their calendar. They are also receiving information shared by Grandma and Nana, who each have their own tab.

Clicking on the “Share” button in the upper left hand corner opens a dialog (Figure 1b) showing SPARCS’s sharing suggestion (comprised of 3 photos and 4 calendar events). The photos are chosen randomly from a directory (including sub-directories) specified by the user. The “Browse” button can be used to find a specific photo if desired. While SPARCS focuses on sharing, we also hoped families might enjoy seeing the suggested photos each day.

The suggested events are the next four events on the Jones’s family calendar. Events continue to be suggested until the date on which they occur has passed, so some events may be suggested multiple times. The calendar events are pulled automatically from an iCalendar-formatted file or feed (e.g., a shared online calendar), or directly from Outlook. Given potential privacy concerns about sharing calendar data, events can be directly edited, or be removed using the “Don’t Share” buttons. If the auto-previewing option is selected, SPARCS opens the sharing dialog automatically every day at a user-specified time. This specified time is displayed in the main window (10:00 am, Figure 1a, upper left) as a reminder to the user.

When the user clicks “Share Now” in the Sharing dialog (Figure 1b), SPARCS shares information by publishing entries to a Windows Live Spaces blog, which acts as the server and storage for published data. SPARCS also includes an auto-publishing option that will automatically publish information at a set time after the sharing dialog has been automatically opened (e.g., 30 minutes, 1 hour).

Once the SPARCS entry has been shared, the Jones tab will be updated to show what was just shared. SPARCS uses a publish-subscribe model that allows each family to configure SPARCS to subscribe to the information they care about. For example, Grandma could subscribe to Nana’s shared information if she wanted, but she does not need to. To help families stay aware of shared information, SPARCS checks for new information every minute and brings the main window to foreground when updates occur. We also configured SPARCS to install itself in the start-up menu and close to the taskbar (similar to many IM programs). To view previously shared content, the user clicks on the “View History” button (Figure 1a, bottom left). This opens that family’s blog in a browser showing all previous SPARCS entries and comments (Figure 1c).

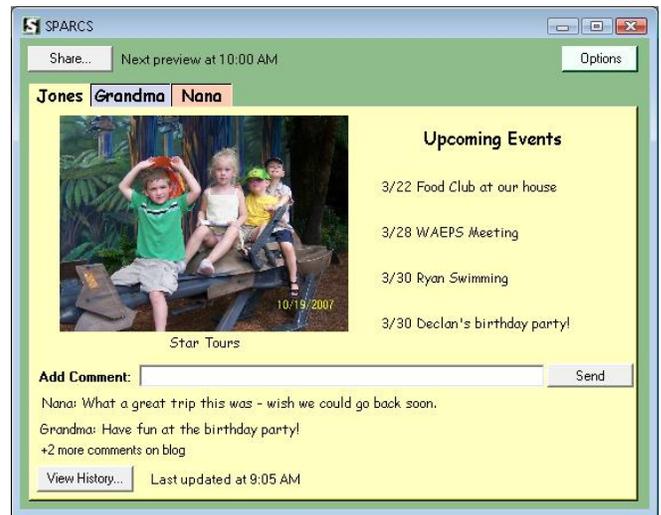


Figure 1a: SPARCS main window showing pictures and events shared by the Jones family, and comments from relatives.

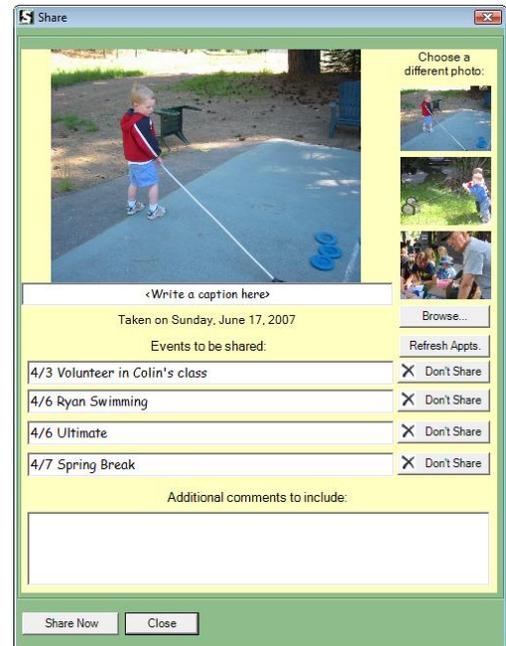


Figure 1b: Sharing dialog opened either automatically at the preview time or by clicking on the “Share” button in 1a.

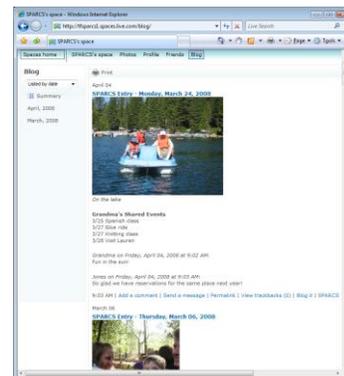


Figure 1c: Grandma’s SPARCS blog on Windows Live Spaces.

Extended family members who do not have SPARCS can also view the shared information published to this blog, which is public in the prototype implementation

Given the importance of feedback found by previous research [e.g., 7, 17], we designed SPARCS to support conversations around shared information. As seen in the main window (Figure 1a, bottom), Grandma and Nana have both commented on the Jones's shared information and "+2 more comments on blog" below the comments alerts the viewer to the presence of additional comments. The Jones's can reply to the comments by typing into the "Add Comment" box and clicking the "Send" button. Comments are associated with a SPARCS entry. Publishing a new entry clears the comment space, although comments on previous entries are available on the blog.

Because Windows Live Spaces supports RSS, extended family members who do not have SPARCS can also subscribe to the RSS feed to receive emails or notifications when new information has been shared. Other devices that can read RSS feeds could also be used to view shared information, such as a digital photo frame.

#### **RELATED WORK**

Many systems that strive to support connectedness focus on displaying information about the current state of an extended family member, such as their well-being or presence at home. For example, the Digital Family Portrait [14] and CareNet [3] systems both explored automatically providing information to remote caregivers about the health and well-being of an elder, while the Casablanca project's Intentional Presence Lamp [8] allowed people to indicate their availability to others for communication. Similarly, Dey and De Guzman's physical peripheral awareness devices [5] were shown to provide better awareness and connectedness to loved ones than traditional graphical displays of online presence. While information about presence and well-being can be important for helping people feel connected, SPARCS strives to help people share information about their activities, which previous research has shown extended family members to be interested in [15, 16].

Several prototypes have explored dedicated connections between households so family members can exchange information with each other such as digital post-it notes [9], snapshots from a home web camera [9], and scanned information [8] as well as messaging between a display at home and a web portal [19]. Another set of prototypes have explored sharing photos taken on mobile phones to help people capture and share experiences in the moment. eKiss [4] enabled sharing between children and parents through a mobile photo blog, while ASTRA [17] and Collage [1] displayed messages and photos taken on a mobile device on a display in a home (or several homes with Collage).

While SPARCS also focuses on exchanging information between households, it differs by using pre-existing content (e.g., previously-taken photos) and proposing content to

share in an attempt to reduce authoring costs [6] and the burden on the sharer to think of or create something to share. However, many of the findings of the ASTRA project [17] influenced the design of SPARCS, particularly the importance of making the sharing experience lightweight for both sharers and receivers and of providing mechanisms for feedback. Field trials of ASTRA found that people have a strong need to receive and send immediate reactions to pictures, which ASTRA did not sufficiently support. Others such as Frohlich et al. [7] have also found that allowing receivers to comment or ask questions validates the effort that users put into sharing. Romero et al. [17] also found that utility-oriented topics for initiating communication, such as asking for advice on a practical matter, are sometimes needed and appreciated as an excuse for engaging in purely social communication. By always sharing a photo and calendar events, SPARCS may give people something to comment on and react to.

A number of commercial systems allow people to share information with others, for example, websites that enable people to publish photos (e.g., Flickr, Picassa, MySpace), calendars (e.g., Google Calendar, 30 Boxes), or blog entries (e.g., Blogger, Live Spaces). These websites typically require users to update their information manually, which can discourage people from sharing often. In contrast, SPARCS automatically recommends information to share and encourages a frequent exchange of information.

Finally, SPARCS's emphasis on sharing small amounts of information daily is similar to Today messages [2], short daily status emails sent to work colleagues, and the Transient Life system [18]. Transient Life allows people to gather information tidbits on the fly (e.g., photos, to-do lists, links) and easily publish it as a Today message or blog entry to enhance awareness between work colleagues. SPARCS differs from Today messages in that the focus is on sharing between family members rather than work colleagues. SPARCS also tries to reduce the effort of sharing information to a much greater extent than Transient Life by automatically recommending photos and calendar information for users to share.

#### **ITERATIVE DESIGN METHOD**

To help inform the design of SPARCS, we conducted two user studies with a total of 28 parents and grandparents. Our participants included 8 mothers, 6 fathers, 7 grandmothers, and 7 grandfathers, recruited from a large North American city. Since our goal was to augment existing relationships, we chose participants who communicated with one or more extended family members at least twice a month. We also chose participants who took at least 30 digital photos a year. Beyond that, we sought a diverse group that varied in age, family composition, and experience with technologies such as digital calendars and photo-sharing websites. Each participant received a software item as remuneration.

Our design process began with a low-fidelity paper prototype. After reaching what we felt was a reasonable

design (Figure 2, left), we had 6 parents (3 male) and 6 grandparents (3 male) participate in individual user study sessions. During these sessions, we first interviewed each participant on their current communication and sharing habits. Next, we had each participant perform a series of tasks with the paper prototype to give them an idea of what using SPARCS would be like. We used a wizard-of-oz approach to simulate use of the system, with an experimenter updating the paper prototype as needed.

Using the feedback we gained from the initial sessions and interviews, we iterated on our paper prototype and created a medium-fidelity digital design (Figure 2, right). We then had the remaining sixteen participants participate in a formative evaluation of our digital prototype. This study used the same method as the first study except: 1) most participants used their own photos and calendar data while interacting with the digital prototype, and 2) we had participants try two versions of SPARCS in order to investigate the relative value of sharing photos vs. calendar events. Half the participants first used a photo-only version of SPARCS and then the full version (Figure 2, right) while the other half used a calendar-only version and then the full version. Qualitative data gathered was analyzed using affinity diagrams to identify common themes. We collected quantitative data from the semi-structured interviews and questionnaires that participants completed.

### Key Findings

During the interviews about their current communication and sharing habits, 22 of 28 participants expressed a desire for more communication with at least one member of their extended family, suggesting unmet needs. Participants also described challenges with their current communication and sharing practices, which highlighted trade-offs between facilitating interaction without introducing obligation, reducing effort without trivializing the communication, and balancing awareness with privacy, all tradeoffs SPARCS tries to address. More details about current communication are reported in [20]; here, we focus on participants' reactions to the SPARCS prototypes.

Initial interest in SPARCS was promising; 9 of 12 participants who used the paper prototype and 15 of 16 participants who tried the digital prototype indicated they would be interested in using SPARCS to share photos and calendar information with their extended family. Key findings common to both initial user studies were:

**Lightweight sharing seen as important:** SPARCS' support for lightweight sharing appealed to participants, with almost half (13 of 28) reporting ease of use for sharing or receiving information as their favorite aspect of SPARCS. Participants liked how sharing suggestions let them share photos "without having to think", and they also liked how SPARCS pulled together information from different families into one place where photos and calendar information were easily accessible. Some participants remained concerned about effort. For example, one

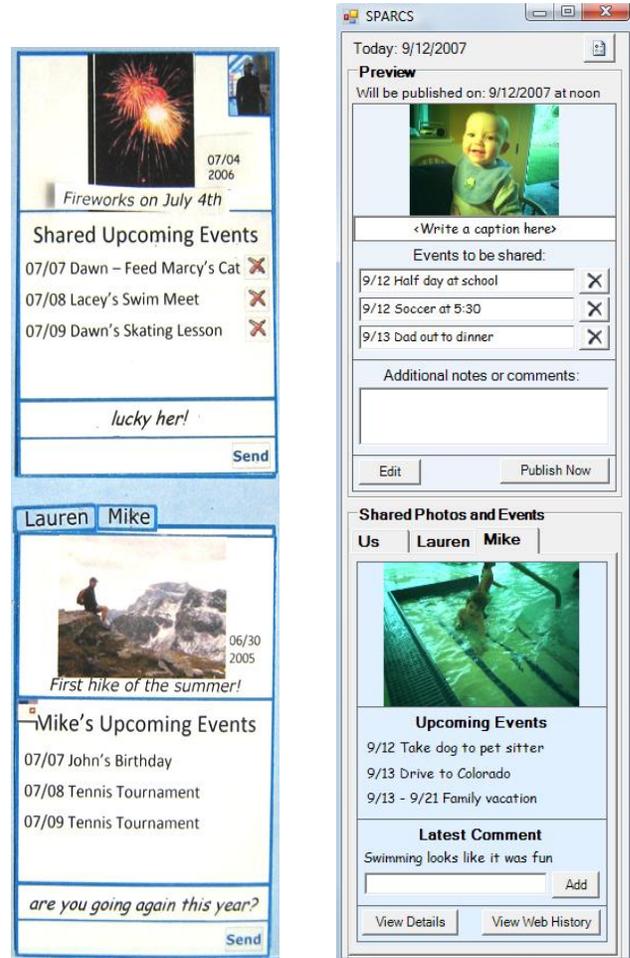


Figure 2. SPARCS paper (left) and digital (right) prototypes.

grandfather said "Some of this I think is nice, but some of it seems like I don't have time for that kind of thing."

### Photos seen as more valuable, but events also interesting:

For the 16 participants in our second study, the addition of photos to SPARCS seemed more valuable than the addition of calendar information. All 8 participants (100%) in the calendar-only condition found the addition of photos to SPARCS valuable, while only 4 participants (50%) in the photo-only condition found the addition of calendar information valuable. However, it is important to note that many participants liked the combination of photos and calendar information together; 12 of the 16 participants (75%) wanted to see a combination of both from at least one extended family member. Overall, it appears that photos as a visual component are important to have in SPARCS, while calendar information, though seen as useful, may not be as critical.

**Adoption concerns:** Several participants were interested in sharing through SPARCS, but felt that getting extended family members to use SPARCS would be a challenge. For example, one mother told us that her extended family would likely not use SPARCS because "[the idea] is pretty out there for them." Similarly, another mother commented, "I

think that everyone minus my uncle would be interested. In terms of who would do it... that would be another thing.”

### FIELD STUDY

The feedback we gathered in the initial lab studies helped us redesign SPARCS and suggested that parents and grandparents would be interested in using SPARCS. To explore the use of SPARCS and the potential of sharing suggestions over a longer time, we conducted a field study with seven pairs of related families<sup>1</sup>.

Given that field studies are a tradeoff between control of a participant’s experience and realism, it can be hard to understand usage and gather feedback about a prototype without having something to compare it against. Thus, we decided to also have our participants use MessyBoard [6], a shared digital bulletin board system, during the field study. We chose MessyBoard because the system also strives to support lightweight sharing; however, it supports freeform sharing in contrast to SPARCS’s structured sharing and MessyBoard does not make sharing suggestions or remind participants to use it<sup>2</sup>. By having participants experience both prototypes, we could compare and contrast their feedback and gain richer insights into the impact of SPARCS on communication and connectedness between family pairs. We first describe MessyBoard in more detail and then we describe the field study.

### MessyBoard

MessyBoard runs as a Java application in a web browser. Users can post notes, photos, drawings and web links to their MessyBoard (Figure 3). Objects are added, modified, or deleted by clicking the right mouse button on the background of the MessyBoard to bring up the action menu. Users are free to add as much content as they desire, and MessyBoard supports freeform layout so all content can be repositioned on the background in whatever location the user prefers. Participants can also choose a color to represent objects they place on the screen. For example, in Figure 3, two photos have been added to the MessyBoard along with four notes (two from each user). While MessyBoard was originally designed to support collaboration among small work groups, Fass’s Internet deployment showed that MessyBoard could appeal to other types of groups including families and friends [6]. For the field study, we set up our own MessyBoard server and created a MessyBoard for each family pair to share.

### Participant Families

Given our initial studies, we tried to recruit pairs of parents and grandparents to participate. Unfortunately, this proved too difficult so instead we recruited pairs of families with a



Figure 3. MessyBoard example. Each note color represents a different user.

mix of relationships and presence of children. (Table 1, Relationship, Kids at Home). All 14 families were located in the U.S. We required that the families in each pair live at least one hour away from each other by car since we felt SPARCS would be more valuable to families that did not see each other in person often. Distance between participant families varied; 3 pairs lived in the same state and 4 pairs lived in different states (Table 1, Location).

For each family, there was a primary contact person, although others in the family could use the prototypes if they wanted. Given the geographically-distributed nature of our participants, we could not visit all families in person; for consistency, we conducted the study completely through email and phone interactions. This meant most of our interactions were with the primary contact person, who we refer to as participants. All participants reported using a computer at least 5 times per week. Eleven participants considered themselves average computer users, and no one reported being a novice or an expert.

### Procedure

We conducted a within-subjects field study that lasted five weeks. During the first week, the primary contact person completed a daily communication diary where he or she recorded all communication (e.g., phone, email, in person) with extended family members. Next, the participants and their families used SPARCS and MessyBoard on their own computers for two weeks each, where the order of use was counter-balanced across pairs. During the entire study we made ourselves available to participants via email and phone for support, and helped them through any technical problems they encountered. We did not, however, persuade them to use the prototypes.

During the installation phone call for MessyBoard, we ensured that the families had the appropriate version of Java on their computer, gave them the address and password of their pair’s MessyBoard, and demonstrated (over the phone) how to view, add, and delete MessyBoard content.

To set up SPARCS, we asked participants to put some of their calendar information into a digital form for two weeks of the study. We provided participants with a Windows Live Calendar (<http://calendar.live.com>) that they all opted to use, including the five participants who already used a different digital calendar. Prior to the installation call for

<sup>1</sup> We recruited 8 pairs of families; however, one of the pairs became non-responsive and withdrew from the study.

<sup>2</sup> The MessyBoard system at one time included a screen-saver showing shared content, but this feature is no longer supported so we were not able to deploy it.

Pair	Relationship	ID	Primary Contact	Kids at Home	Location	Age Range	SPARCS Total	MB Total	Final Preference	Would Use
A	Sisters-in-Law	A <sub>1</sub>	Sister	Yes	WA	40-49	19	10	MessyBoard	Both
		A <sub>2</sub>	Sister	Yes	AZ	40-49	22	12	SPARCS	SPARCS
B	Daughter and Father	B <sub>1</sub>	Daughter	No	WA	50-59	21	4	MessyBoard	Both
		B <sub>2</sub>	Father	No	AZ	70+	21	20	Either	Both
C	Daughter and Mother	C <sub>1</sub>	Daughter	No	WA	40-49	11	14	MessyBoard	Both
		C <sub>2</sub>	Mother	No	WA	70+	15	15	MessyBoard	MessyBoard
D	Sister and Brother-in-Law	D <sub>1</sub>	Sister	No	WA	50-59	29	16	SPARCS	SPARCS
		D <sub>2</sub>	Brother-in-Law	No	UT	70+	26	10	SPARCS	SPARCS
E	Brother and Sister	E <sub>1</sub>	Brother	Yes	WA	30-39	6	5	SPARCS	SPARCS
		E <sub>2</sub>	Sister	Yes	HA	40-49	6	6	SPARCS	Both
F	Daughter and Mother-in-Law	F <sub>1</sub>	Daughter	Yes	WA	20-29	17	22	MessyBoard	Both
		F <sub>2</sub>	Mother-in-Law	Yes	WA	40-49	9	11	MessyBoard	MessyBoard
G	Daughter and Step-Father	G <sub>1</sub>	Daughter	Yes	WA	50-59	25	56	MessyBoard	MessyBoard
		G <sub>2</sub>	Step-Father	No	WA	70+	5	31	MessyBoard	MessyBoard

**Table 1: Field study participants. SPARCS Total and MessyBoard (MB) Total columns denote the total amount of content shared by a participant using that prototype. The first four families used SPARCS first; the last three started with MessyBoard.**

SPARCS, we asked participants to install .NET Framework 3.5. During the install call, we configured SPARCS to point to a directory with photos and to pull events from the calendar. We helped participants choose the time they wanted the SPARCS sharing dialog to automatically appear each day. We also subscribed each family to information shared by their relative. We then walked participants through the process of sharing one SPARCS entry, making some comments, and viewing the Windows Live Space where their entries and comments were being posted to make clear it was public.

#### Data Collection

We collected data about participants' experiences using SPARCS and MessyBoard in several ways. During the second week of use for both prototypes (the 3<sup>rd</sup> and 5<sup>th</sup> weeks of the study), participants completed communication diaries. We also conducted phone interviews with them about their experiences that lasted about 15-30 minutes. Additionally, they completed a pre-survey before starting the study and post-surveys after using each prototype. A final survey asked participants to compare their experiences with the two prototypes. Survey questions about obligation, privacy, and staying in touch were adapted from relevant scales in the ABC-Q questionnaire [17].

Both prototypes also logged interactions. SPARCS logged when participants shared information and whether they switched the photo selected, edited calendar entries, added comments, or viewed the blog. MessyBoard logged all

items added or deleted. We eliminated any interactions that occurred during the installation calls from our analysis.

#### EXPERIENCE USING THE PROTOTYPES

Overall, participants shared a considerable amount of content using both prototypes (Table 2, SPARCS and MessyBoard Total columns, 232 total items for each prototype). These columns also highlight the individual variation in amount shared. The type of content that was shared differed considerably across the prototypes. In SPARCS, 66% of the content shared was SPARCS entries (153<sup>3</sup>) and 34% was comments (79). In MessyBoard, 68% of the content shared was notes (158), 28% (64) was pictures, and 4% were other things like drawings. This supports Fass' observation that use of notes dominates MessyBoard interaction [6].

We saw two main styles of use of SPARCS among participants. In 5 of the 7 pairs (A, B, C, D, E), both families shared roughly equal amounts of content during the study, often making comments on each other's shared content. For example, on one day A<sub>1</sub> mentioned her daughter's birthday party (which was one of the shared calendar events), and A<sub>2</sub> responded with a question about party plans. Two days later, A<sub>1</sub> posted a picture of the party and A<sub>2</sub> mentioned her sadness at being unable to attend. Both families in Pair D also used SPARCS as a photo

<sup>3</sup> 3 SPARCS entries did not have photos.

sharing application; each of them had one day where they posted more than 6 photos. The final two pairs (F, G) had unbalanced use where one family published and the other made comments. G<sub>2</sub> had technical difficulties using SPARCS on a very old computer which contributed to his lack of use, while F<sub>2</sub>'s husband decided to install SPARCS on his daughter's computer in her room, which was not always available to use.

The freeform nature of MessyBoard meant that the participants could use it in any manner they wished. Three main styles of use emerged. Two pairs of families (A, G) used it primarily as an asynchronous chat tool, leaving lengthy, conversation-style notes and posting very few photos. Two more pairs (D, F) used it primarily to share photos, and notes were used to either caption the photos or make short comments about the photos. Lastly, two pairs (B, C) exhibited a combination approach where they had asynchronous conversations using MessyBoard, but also used it to share photos and comment on them. The remaining pair (E) only used the system a few times.

At the end of their final condition, we asked participants which prototype they preferred for sharing with their partner family and why (Table 1, Final Preference). MessyBoard was preferred by 8 participants, SPARCS by 5 participants, and 1 participant had no preference. Preferred prototype was highly correlated with perception of more sharing; twelve of the 14 participants told us on the final survey they shared more with the prototype they preferred.

Ease of use was the primary reason mentioned by participants for preferring a particular prototype. Five participants (B<sub>1</sub>, C<sub>2</sub>, F<sub>2</sub>, G<sub>1</sub>, G<sub>2</sub>) explicitly mentioned ease of use for MessyBoard and four participants mentioned ease of use for SPARCS (A<sub>2</sub>, D<sub>2</sub>, E<sub>1</sub>, E<sub>2</sub>). Participants preferring MessyBoard highlighted the single web location (e.g., compared to dealing with the calendar as well) and support for asynchronous conversations, while some of those who preferred SPARCS liked that it was always available and made suggestions.

Experience of a family member also had a large effect on preference. For example, F<sub>2</sub>'s lack of use of SPARCS led F<sub>1</sub> to tell us she preferred MessyBoard because there was more communication. However, as the "Would Use" column in Table 1 shows, F<sub>1</sub> answered "Both" when asked what she would use if both prototypes were available in the future. Similarly, C<sub>1</sub> was willing to use both, but told us in the phone interview that she chose MessyBoard because "I'm trying to get my mom to branch out a little and she really enjoyed MessyBoard. Anything that is easy for my mom to use is okay with me." E<sub>2</sub> was also willing to use both, but preferred SPARCS because E<sub>1</sub> had difficulty accessing MessyBoard, most likely because of a slow internet connection, and they hardly used it.

### **Effect on Communication and Connectedness**

We received communication diaries from ten participants for weeks 1 and 3 and from nine participants for week 5.

Most of the communication reported in the diaries was done by phone (50% of all communications), email (14% of all communications), text messaging (22% mainly due to F<sub>1</sub>), and face to face (12%). While the diaries gave us a picture of how our participants communicate, there was too much variability even within participants to see changes in other types of communication based on use of the prototypes.

Data collected in phone interviews suggested that for many participants, using one or both of the prototypes increased their overall communication. Six participants said that SPARCS had increased their communication (A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, C<sub>2</sub>, D<sub>1</sub>, E<sub>2</sub>). For example, D<sub>1</sub> said, "Absolutely there are pictures I never would have seen." Seven participants (A<sub>2</sub>, B<sub>1</sub>, D<sub>2</sub>, F<sub>1</sub>, F<sub>2</sub>, G<sub>1</sub>, G<sub>2</sub>) said MessyBoard increased their communication. F<sub>2</sub> said, "It's increased the number of pictures I get," and G<sub>1</sub> said, "We've shared more of little snippets of information with each other that I wouldn't necessarily call him about."

A goal in building SPARCS was to explore whether it would help extended family members feel more connected. In interviews, eight participants explicitly told us they felt more connected (A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, D<sub>1</sub>, E<sub>2</sub>, F<sub>1</sub>) after using SPARCS. When asked if SPARCS made it easy to stay in touch with their relative the median response on the survey for this group was "Agree" (5-point Likert scale from Strongly Agree to Strongly Disagree), which supported comments made in interviews. Two other participants felt they were already well connected (C<sub>2</sub>, E<sub>1</sub>). The remaining four, including the two that had the most technical challenges (F<sub>2</sub> and G<sub>2</sub>), did not feel more connected. For MessyBoard, ten participants commented in interviews about feeling more connected after using it (A<sub>1</sub>, A<sub>2</sub>, B<sub>1</sub>, B<sub>2</sub>, C<sub>1</sub>, C<sub>2</sub>, F<sub>1</sub>, F<sub>2</sub>, G<sub>1</sub>, G<sub>2</sub>). Their median response was also "Agree" that MessyBoard made it easier to stay in touch with relatives. In the interviews, participants emphasized that the additional sharing and communication contributed to the feeling of connectedness.

Researchers [e.g., 8, 20] have observed that one possible risk of deploying prototypes like SPARCS and MessyBoard is increasing a sense of obligation relatives might feel to communicate. Our participants did not appear to feel a general obligation to communicate. The median response on the pre-survey was "Strongly Disagree" when asked "I feel obligated to communicate with <name of relative>." Participants' sense of obligation to use the prototypes seemed to be slightly higher, but still not strong. The median for whether participants felt obligated to use SPARCS was between "Neutral" and "Disagree" and was "Disagree" for MessyBoard. While none of these medians were significantly different based on a Friedman test, 7 participant's responses did indicate a higher level of obligation with both of the software prototypes, compared to their pre-survey responses.

The prototypes seemed to help some participants that wanted to (or felt obligated to) communicate frequently.

Some participants mentioned that the prototypes reduced the need to call ( $A_2$ ,  $C_1$ ) or the length of a call ( $A_1$ ). The benefits in reducing the burden of communication did not seem specific to a particular prototype. For example,  $A_2$  mentioned feeling a reduced need to call in interviews after using each prototype, and  $F_1$  felt both prototypes reduced requests by  $F_2$  for photos. Three participants stressed the value of the asynchronous communication afforded by the prototypes ( $C_2$ ,  $E_2$ ,  $G_1$ ). For example,  $C_2$  told us, “She [ $C_1$ ] goes to work really early and goes to bed early at night, so I can send her something and tell her what’s going on here without bothering her on the phone.”

### Privacy

Another concern SPARCS tries to address is supporting sharing while respecting privacy; in particular the sharing dialog (Figure 1b) attempts to make it easy to edit suggested photos and calendar events. On the surveys we asked participants whether through their communication (pre-survey) or use of the prototypes (post-surveys), the partner family learned more about the participants than the participants wanted them to know. The median response was between “Disagree” and “Strongly Disagree” about general communication and “Disagree” after using each of the prototypes. We were even somewhat surprised that three participants ( $B_2$ ,  $D_1$ ,  $F_2$ ) turned on the auto-publishing option during the study (one for the entire time; two others midway). Still, 89% of SPARCS entries were published manually, suggesting that most people were reviewing things before publishing them.

Actions taken and comments by some participants highlight remaining privacy concerns around information being shared in SPARCS. Two ( $B_1$ ,  $B_2$ ) of the five participants with existing digital calendars who chose to create a “fake” calendar explicitly mentioned privacy concerns. In particular,  $B_2$  was concerned about doctor’s appointments that might upset his daughter. Referring to photos,  $G_1$  said, “I guessed it was going to randomly post pictures, so I made a concentrated effort to find the picture I wanted... But that held me from putting other pictures on my computer until this was over.”  $B_1$  said, “I did have to watch that [the photos being shared], all of sudden there was my daughter giving birth, oops!”

### Sharing Suggestions

Daily sharing suggestions are the way SPARCS tries to facilitate sharing while reducing effort, so we were particularly interested in participants’ reactions to them. On average, the sharing dialog was opened 20.9 times for each user ( $Mdn = 16.5$ ,  $SD = 15.2$ ) and of these, SPARCS automatically opened the dialog an average of 8.9 times ( $Mdn = 9.5$ ,  $SD = 4.04$ ; 8 participants chose a preview time between 8 am and 10 am; 6 participants chose a time after 5 pm). The rest of the time, participants manually opened the dialog by clicking on the “Share” button.

Ten participants ( $A_1$ ,  $A_2$ ,  $B_1$ ,  $B_2$ ,  $D_1$ ,  $D_2$ ,  $E_1$ ,  $E_2$ ,  $F_1$ ,  $G_2$ ) made positive comments in the phone interviews about being reminded to share.  $A_2$  mentioned, “I like how in the

morning, when I turn my computer on, it’s already showing” and  $A_1$  said, “I like the suggestion, if nothing else, it prompts me to dig up another one [photo]. If there was nothing there, I might not send anything.” Three participants ( $A_2$ ,  $B_1$ ,  $C_2$ ) also mentioned personal delight about photos in the phone interviews. For example,  $C_2$  said, “It’s been kind of fun to see those pictures, popping up, makes you remember.” However,  $B_1$  highlighted both positive and negative aspects of suggestions, saying, “It gets me thinking, sometimes I’ve thought, yeah that’s a good idea. Other times it doesn’t seem to be, whether it’s my mood or what it’s popping up with is appropriate at that time.”  $A_2$  and  $C_1$  both told us they felt obligated to share because of the reminder.

In MessyBoard, the lack of sharing suggestions was an issue some of the time. Two participants ( $A_1$ ,  $D_1$ ) made negative comments about needing to “remember to do it”. Also, when people’s use of MessyBoard decreased, their partner left notes prompting them to interact: “Ok, Granny is waiting for more pictures now” ( $F_2$ ), and in three of the pairs, one participant explicitly prompted the other.

### Photo Suggestions

In general, participants seemed to like sharing photos through SPARCS. The median response on the post-survey was “Agree” that participants liked sharing photos with SPARCS. Six participants ( $A_2$ ,  $B_2$ ,  $C_1$ ,  $D_1$ ,  $D_2$ ,  $E_2$ ) mentioned photos on the post-survey when asked what they liked best about using SPARCS. For example,  $B_2$  said, “I saw pictures that I had not seen before” and  $C_1$  said, “I was looking forward to seeing what pics my mom was going to share and her comments.” Of the photos shared in SPARCS, 63% (96) had captions and 66% of all comments related to the pictures. Many fewer photos were shared in MessyBoard (64 compared to 153), but participant comments and survey responses suggest photos were appreciated in MessyBoard as well.

Each SPARCS sharing suggestion contains a set of 3 photos that were randomly selected from a specified directory tree. Log data showed that 43% ( $Mdn = 45\%$ ,  $SD = 29\%$ ) of photos shared by participants were ones suggested by SPARCS. As the large standard deviation highlights, use of suggested photos varied dramatically between participants. Whether or not participants used the suggested photos seemed to have no direct affect on whether they liked SPARCS better or not. Of the 5 participants that preferred SPARCS and the one that had no preference, the percentage of suggested photos they shared ranged from 0 – 55%.

Participant comments highlighted some frustrations with random selection. The two most common reasons given for picking a different photo were to select a more recent picture (5 participants:  $A_1$ ,  $A_2$ ,  $E_1$ ,  $E_2$ ,  $G_1$ ) or to share something of interest to the other family ( $A_1$ ,  $B_1$ ,  $C_2$ ). For example,  $G_1$  commented, “Since I had just received a new batch of pictures, I knew I hadn’t had a chance to share those, so I was pulling ones I knew he had not seen.” Three

participants (B<sub>2</sub>, D<sub>1</sub>, D<sub>2</sub>) did use the options menu to change the photo directory SPARCS used during the study at least once, which gave them more control over which photos were selected.

The phone interviews suggested that photo organization was one of the biggest challenges participants faced for sharing the photos they wanted using SPARCS. Two participants (D<sub>1</sub>, E<sub>1</sub>) told us about explicitly moving photos to the computer to share. D<sub>1</sub> said, "It also forced me to get photos on my computer so I can send pictures of my grandkids." Two other participants (C<sub>1</sub>, F<sub>2</sub>) had problems with a lack of photos on their computers. D<sub>2</sub> was confused to have pictures suggested that had been added to his computer by someone else.

#### *Calendar Suggestions*

Participant response was mixed about the value of sharing calendar information in SPARCS. When asked on the survey, the median response was "Neutral" to "I liked sharing calendar information using SPARCS." Four participants (B<sub>2</sub>, C<sub>1</sub>, D<sub>1</sub>, F<sub>1</sub>) mentioned the calendar when asked what they liked best about using SPARCS, while one (A<sub>2</sub>) said the calendar was what she liked the least.

Four participants (E<sub>1</sub>, E<sub>2</sub>, F<sub>2</sub>, G<sub>2</sub>) did not adopt the calendar and shared 10 or fewer events in SPARCS. The other ten participants each shared more than 32 total events during the study ( $M = 49.4$ ,  $Mdn = 43.5$ ,  $SD = 17.53$ ), although many were duplicates since events are suggested until after they occur. The average number of unique events shared by a participant over the course of the study was 13.5 ( $Mdn = 15.5$ ,  $SD = 4.97$ ). While less common than for photos, referring to calendar events or coordination happened in 25% of comments. For example, B<sub>2</sub> wrote, "We do our thing Mar. 2<sup>nd</sup>." Interestingly, two participants (A<sub>2</sub>, D<sub>1</sub>) commented that they liked seeing their own calendar information in SPARCS. For example, D<sub>1</sub> said, "I usually keep it [her appointments] in my head so good to see it."

One of the main problems with the calendar suggestions was that SPARCS was not well integrated with Windows Live Calendar since we had designed SPARCS to pull events from a variety of sources. Six participants (A<sub>1</sub>, A<sub>2</sub>, B<sub>2</sub>, D<sub>1</sub>, F<sub>2</sub>, G<sub>1</sub>) expressed frustrations with this lack of integration including trouble remembering the location of the calendar applications and wanting to enter and modify events on the calendar using SPARCS.

#### **Sharing Frequency**

SPARCS makes daily sharing suggestions. At the end of the study all participants, except for A<sub>2</sub>, told us they do not want to share daily using SPARCS. The ideal frequency of any communication with their pairs ranged from daily (A<sub>2</sub>, C<sub>2</sub>, F<sub>1</sub>, F<sub>2</sub>) to a few times a week (A<sub>1</sub>, B<sub>2</sub>, B<sub>1</sub>, C<sub>1</sub>, E<sub>1</sub>, E<sub>2</sub>, G<sub>1</sub>, G<sub>2</sub>) to once a week (D<sub>1</sub>) or once a month (D<sub>2</sub>). Ideal frequency of sharing photos was less often, ranging from a few times a week to once a month to occasional events. Besides wanting more infrequent communication, C<sub>1</sub> highlighted another challenge around daily sharing saying,

"By the end of the week I was running out of options," because she did not have very many photos to choose from. Integrating photos taken on mobile devices, as other systems have done [e.g., 1, 4, 17], could help SPARCS address this challenge.

#### **DISCUSSION**

Our experience building SPARCS and the feedback from our study participants suggest considerations for others building systems that support sharing.

**Consider sharing suggestions:** Most of our participants made positive comments about the sharing suggestions in SPARCS and liked being reminded to share. While their feedback highlights valuable refinements including better customization for the frequency of the suggestion (e.g., every few days or once a week), we believe our participants' experience demonstrates the potential for suggestions to encourage sharing of content, particularly photos. While each application is different, we encourage others to consider whether including some type of suggestion in their application might help reduce the amount of effort it takes users to share content.

**Consider asynchronous chat:** In the interviews and surveys, many participants explicitly commented about the benefit of asynchronous conversations in MessyBoard. For example, G<sub>1</sub> said that "You can just throw a note on there, whenever you want, and when they see it they can respond." While SPARCS has comments, they are tied to a SPARCS entry and once a new entry is published, past comments are only available on the blog, which can disrupt a conversation. We believe SPARCS would benefit from decoupling the comments from the SPARCS entries to better support on-going conversations. We encourage developers of other applications that support sharing to consider including support for asynchronous persistent conversations as seen in MessyBoard, where there is a common place for notes to persist until users choose to delete them (e.g., after they have been read).

**Support different types of families:** The challenge of building software for families was reinforced to us in several ways. First, in our initial studies we heard concerns about whether family members would adopt a system like SPARCS. Additionally, during the second study, if one partner family had a bad experience, that affected the experience for the pair with that prototype. While perhaps not surprising, our experience reinforces the importance of building software that is easy to use by the least technical member of the extended family.

On a more positive note, during interviews, participants asked about extending their use of the prototypes to include additional family members. This highlights the importance for SPARCS, MessyBoard, and other similar systems to support an easy invitation process as well as alternative ways for people to view shared content. For example, although not a focus of the study, the webpage that SPARCS creates could be easily shared with others.

## CONCLUDING REMARKS

The experience of our field study participants helped us understand important features for systems to support connectedness. As with any study, ours had some limitations. We focused on sharing between pairs of families, however, sharing among extended families frequently involves multiple families and future studies should explore this. We also interacted primarily with one member of each family. In addition, although comparing two prototypes helped us understand the positive and negative aspects of each, a longer study would be beneficial to understand long term use. For example, the need to visit MessyBoard to see new content may become more frustrating in a longer study or the sharing reminders in SPARCS could become more annoying over time.

Based on our findings, we feel that sharing photos in both SPARCS and MessyBoard sparked conversations between family members and helped participants feel more connected to their family members. We also saw the benefits of providing sharing suggestions to encourage people to share photos and the value of asynchronous chat in supporting conversations. Based on the study, we are redesigning SPARCS to decouple comments from a particular SPARCS entry to better support asynchronous chat, developing an improved photo selection algorithm, and making calendar sharing optional, while also improving the integration with Windows Live Calendar. We hope our findings will help designers and developers of other sharing systems to enhance their own systems to better support sharing between extended family members.

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