Media2gether: Sharing Media during a Call

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ABSTRACT
Telephone calls and videoconferencing are ubiquitous parts of everyday life. As the content of the call may extend beyond just words, people share applications and media using techniques such as screen sharing and email attachments. Little is known about the prevalence of this behavior and the benefits it can provide. We conducted a survey and a lab study to examine media sharing during a video call and found that it can be useful as well as emotionally engaging. Participants indicated that they would be more likely to have more frequent and longer calls if media sharing were easy. Overall, this work demonstrates the importance of exploring communication media that augment and enrich our everyday activities.

Categories and Subject Descriptors
H.4.3. Information Systems Applications: Communications Applications – Computer conferencing, teleconferencing and videoconferencing

General Terms
Design, Human Factors

Keywords
Shared experiences, telepresence, video-mediated communication

1. INTRODUCTION
People have a strong need and desire to maintain connections and awareness with their family, friends and loved ones, whether they live nearby or far away [25]. It is understandable then, that telephone calls and videoconferencing have become ubiquitous parts of everyday life because these communication channels help people stay in touch with each other and maintain social bonds for both personal and professional reasons. Different types of technology such as video chat applications, social networking and media sharing web sites have added more variety to the ways that people can grow and maintain their social ties. Among all of these, audio and video communication applications are rich and easy tools for sharing everyday life, maintaining awareness, and supporting a feeling of togetherness in order to compensate limited face-to-face interactions. Video communication can mediate closeness in a domestic environment. This feeling of intimacy is coming from being mutually aware of each other's life as well as the content that is being shared [17].

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Audio and video chatting has also become mundane in domestic environments and as a result the content of the call may go beyond only conversation, as people may want to share different aspects of their life with one another and move beyond exchanging verbal information. This could include sharing media for different purposes such as entertainment, awareness, excitement or organizing some activities together. For example, one may want to share the photos of his recent trip with his family during video conversation and tell detailed stories about exciting places he visited or his different adventures. People may also aim to organize activities together such as planning for a group trip during a call by sharing map and calendar. As another example of the usefulness of media sharing: it is easier to browse the web page together during a phone call rather than sending back and forth several pictures of online items to a friend to see whether we should buy it or not. It would also be more fun to watch some personal or humorous video with a remote family member or friend and see their facial reactions. Similarly, there are many scenarios that show the desire of adding media to a regular video or audio call.

As people desire to increase the level of communication and sharing within their close social circles [32], technology has offered a variety of ways for people to share different kinds of media such as photos, calendars, videos, blog entries, and other personal or professional information. However, in comparison to the huge expansion of technology offering different ways of sharing media and information, less effort has been put forth in integrating information and media sharing with communication channels such as audio and video chat applications.

Currently, people usually share media during an audio/video call using techniques such as email attachments, picture/video messaging and screen sharing. However, there is still no simple way of embedded media sharing in a call offering mutual interactions where both sides can take the control simultaneously and interact with the media. In fact, supporting higher level of mutual interactions and collaboration in domestic communication channels can make the experience more engaging and useful and also provide more opportunities to do some collaborative activities such as web browsing during a call.

Despite a high desire for sharing different types of media in a call and different techniques for the current practices of sharing media, little is known about the prevalence of this behavior, the benefits it can provide and the way it can enrich a regular call.

On the other hand, the existing options for communication channels benefit our ability to share media by providing live information and supporting a feeling of presence in absence. Without co-presence, we view our photos or other types of media such as our personal video or social posts alone. As a result, there are fewer opportunities for social interactions around media that is usually limited to asynchronous comment threads left by our family or friends. As stated above, communication channels can provide a feeling of togetherness and have potential to support

social interactions. In addition, they can provide more emotional content and detailed stories for presented media compared to media sharing without accompanying video and audio communication channels. Yet the integration of the existing options for communication channels and the possibilities for media sharing has not been explored. The integration of these two components of social technology has the potential to create an experience similar to a traditional way of browsing our physical photo album with our family or friends where we talk about the stories behind the photo together. In fact, the mutual benefits of coupling different kinds of media sharing with audio/video mediated communication channels makes this topic an important area to explore, which has not been studied in domestic environments.

Our goal is to understand the benefits of sharing media in a call, how and why people currently share media in a call and how to best design for this situation. To meet this goal we conducted a survey and a lab study. The survey looked at the current and desired practices of media sharing during a call. For our lab study, we developed our prototype, *Media2gether* following the WYSIWIS approach. Our prototype offers two-way mutual simultaneous interaction with media for sharing photos and Facebook posts by mutual friends. We also used an existing feature of Windows for sharing browsers.

In our lab study, we studied how media sharing can enhance video-mediated communication in terms of emotional connection, engagement, enjoyment and utility. In this regard, we evaluated the benefits and costs of using media with video-mediated communication in different design modalities.

2. RELATED WORK

2.1 Social Dynamics and Media Sharing

People intensively engage in the process of creation and sharing different types of media for several purposes such as entertainment, awareness, collaboration and reminiscing [9,20].

Photo sharing is increasingly being used as every day social activity [28]. Photographs are important in domestic life as a way to represent family traditions, identity and values [6].

Tee et al. looked at current and desired practices of sharing photos between extended families and they found that people enjoy sharing photos together and photos are considered as a good way of connecting with extended families [32].

Due to the popularity of this topic, there has been significant amount of research focused on designing tools for people to share and present photos in order to provide more social connections [1,14,20,28].

Sharing photographs supports reminiscing and collaboration and has outcomes for closeness, togetherness and awareness [30,37]. Reminiscing also supports several social and emotional purposes such as developing relationships and increasing intimacy between people [36]

Social networks also have potential to support reminiscing. Cosley et al. designed a tool for everyday reminiscing and found the potential value of Facebook posts and status updates for this purpose especially with geographically distant people [7].

There are also several designs to provide collaborative browsing to support some collaborative online activities such as searching, shopping or organizing social events [22,24].

Although having a communication channel seems vital to make sharing experiences more engaging and useful, there is less effort to embed these sharing practices within video mediated communication.

2.2 Media for Supporting Conversation and Storytelling

Mementos can trigger memory practices which might shape and evoke conversation, reminiscence, stories and could also facilitate engagement in story telling talk aka “phototalk” around personal photos [29,33,35,41].

O’Hara et al. explored “phototalk” in the context of sharing a meal and they found that the mementoes can provide opportunities for several social practices in social gatherings such as talking about themselves, their interests, showing empathy, expressing affection, and offering different kinds of support and friendship values [29].

Balabanovic et al. found the potential of using digital photos to support some kind of story sharing by designing an interface for sharing and recording stories [1].

Zancanaro et al. built a non-interactive tabletop at a museum café providing relevant context to encourage collocated visitors to engage in a conversation [41].

Photos can also engage children in communication with remote family members through video or audio and also help them participate in every day family conversation [28]. In addition, supporting retrospective storytelling of personal experiences through digital media could benefit people sharing their experiences with both collocated and distant audiences [19].

2.3 Enriching Audio/Video Communication

As people are becoming more and more geographically separated, teleconferencing and video mediated communication (VMC) is gaining popularity. Regardless of distance separation, family and friends still desire to be in touch and involved in each other’s lives [17].

Accessibility, reasonable quality and variety of uses have caused teleconferencing and VMC to become very popular in both work and domestic domains [3,17]. In domestic domains, video mediated communication has been rapidly adopted by home users and is usually considered intimate behavior which is very popular among different groups of audience such as teenagers, couples, remote family members, grandchildren and grandparents [5,8,17,27]. Mass adoption of video applications in domestic environments has brought the need and desire to move beyond verbal conversation and focus on sharing activities through video links [4]. As a result, many HCI researchers have explored systems that go beyond simple audio/video communication to include shared experiences [13]

Neustaedter et al. [27] studied how distance-separated couples keep intimacy and they found that they share diverse activities such as watching television or videos, sharing meals and playing video games. Brubaker et al. found similar behaviors in their interviews of the use of VMC in personal and workplace contexts [4]. In their diary study of mobile VMC, O’Hara et al. [28] found that people used the visual channel to show objects or environments.

There have been several attempts to enhance teleconferencing and VMC [3,13,16,39]. Some studies tried to enhance video communication by enabling people to share an environment [16,18], while others tried to support sharing life experiences in video chat [4,13]. All of these attempts aim to move beyond “talking heads” and present a mutual common ground in

communication. In fact, as part of our adjustment with distance separation we have to move beyond talking heads in order to experience more feeling of presence in absence and togetherness [4].

In spite of the mentioned benefits of using media in domestic daily practices, the benefits that it can provide for video communication has never been studied.

In this work we explore enriching the VMC experience by providing new opportunities for rich engagement around media. We study the benefits and costs of adding media to the video communication and assess whether sharing media during a call can increase enjoyment, emotional connection and usefulness.

Similarly, some systems such as [34] and [35] have been using photos as a way to facilitate communication and provide more context between remote families and particularly children and remote family members; however, prior works have focused less on the integration of communication channels with shared media. In [35] an audio channel provided a way for grandparents and grandchildren to communicate while sharing photos. Watching video and TV in addition to communication channels such as video and instant messaging has been investigated in [21] and [31] but the use of video communication while sharing different types of media has not been explored yet. Our study fills this research gap.

Our work has the same concept as [11] and [29], where photographic materials and personal memory have been used to facilitate reminiscing and conversation in a co-located social gathering. Here, however, we are trying to benefit from using media for a somewhat similar purpose but in remote gathering over video conferencing.

While there are several works such as [20], [23] and [33], which explored the culture of media sharing either in collocated situations or online, none have considered the integration of sharing media with existing communication.

3. SEMI-STRUCTURED INTERVIEW

To have some initial insights, and to better understand the field and design of our survey, we conducted semi-formal, semi-structured interviews with 20 people including full time employees and interns in our global software engineering company. The interview session took around 20-30 minutes and was mainly about their recent and current practices of viewing media with some one else during a call as well as the desired feature that they need but they think current technology cannot support.

We found that distance-separated families and friends tend to share media together during videoconferencing in order to share their experiences with each other. This media sharing mainly consisted of viewing photos together during video talk with their close family or friends. However, some interesting usage was also revealed as one participant used to share his calendar and also a road map to schedule a trip with his father who was living in another country.

Our participants mainly believed that the current technology cannot support mutual interactions easily and they either applied some intuitive techniques to solve this problem or have used other applications to accompany video chat application.

For example, during video chat with her mom, *Abby* wanted to show her some photos of her visit to a recent festival. As there were so many details on the picture she had a difficult time showing different things to her mom even after screen sharing. She made this easier by opening the photo in paint software and circling different areas in the photo that she wanted to show her mom while her screen was shared with her. However, at certain times her mom wanted to refer to some areas in the photo but she had no control and had to give her clue verbally.

This example highlights the features our participants mentioned as desirable: synchronization, the ability to see where the other person is looking or pointing, synchronous manipulation, annotating, facial recognition and tagging.

Having the insights about current and desired practices, we designed our survey for a general audience as well as our own prototype for our lab study.

4. SURVEY AND LAB STUDY

We conducted a two-phase study to explore the current and desired practices of viewing media collaboratively during a call as well as the benefits that this practices can provide to enrich the call.

4.1 Survey Method

We designed a survey to understand and assess users' current and desired practices of sharing media in audio and video calls. The survey was distributed to a general population of 125 participants (provided by Cint.com). Our participants were equally distributed across five different age groups between 18 and 65. Our survey participants were approximately equally distributed by gender (44% Male and 56% Female).

The survey consisted of 32 questions on recent practices, desired practices and demographic information. Recent and desired practices explored the types of media viewed during a call and the frequency of viewing each type of media (e.g. photos, videos, maps, social posts, search engines, and calendars). We were also interested in media sharing practices for different relationships (e.g. significant others, immediate family, friends, colleagues).

Picturing an ideal system to view media with someone else easily with all required and desired features and interactions, we also asked about participants' desired practices of sharing media during a call in an ideal situation. A discussion of survey's findings can be found in the result section.

4.2 Lab Study Method

We conducted a lab study to explore first-hand how people share different types of media during a video call, and the challenges and opportunities of this practice.

In particular we had two questions in mind:

Can sharing media during a call increase users' enjoyment and sense of connectedness?

Can sharing media during a call add significant value in terms of usefulness?

4.2.1 Media Sharing Prototype

The goal of the study was to explore three different types of media sharing during a video call: photos, Facebook posts by mutual friends, and web browsing. Media sharing was supported on a touch-enabled surface computer, while the video call was established using a laptop computer running Skype. We ran our prototype in a separate device as we felt this better reflected a future scenario where devices are plentiful and a secondary device, such as a tablet, might naturally be used for photo viewing. This is akin to how someone might look at a physical photo album while having a Skype call on a laptop. Figure 1 shows a participant using this configuration.

Figure 1. Skype window is being shown on laptop while the shared media is being displayed on a surface tablet.

Sharing photos and Facebook posts were enabled through a custom application we developed, while shared browsing was supported using windows remote assistance to establish a peer-to-peer connection over a LAN or Internet. Remote assistance allows remote users to easily share their desktop where both parties can have full control over the shared browser. Our custom Photo/Facebook Viewing application consisted of two separate views: Photo View and Facebook View. In Photo View (see Figure 2), each participant's photos are shown in a vertical side bar down either side of the screen. Users can jointly view photos by tapping on a photo (either their own photo or their partner's) which will cause it to appear full-size in the middle of the screen (e.g., the cooking photo in Figure 2). We followed the WYSIWIS approach. In addition, both users have full control and users have their own telepointer (distinguished by different colors), which enables them to point and gesture to any part of the photo simultaneously.

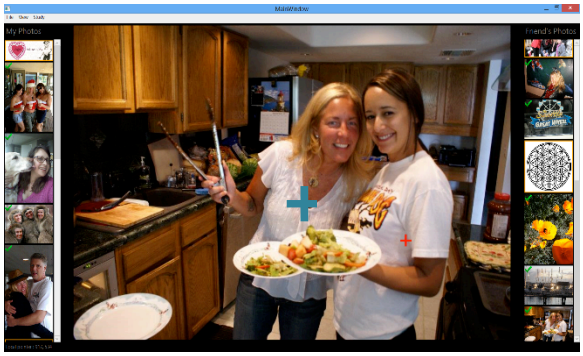

Figure 2.Photo View app.

The telepointer approach was different from screen sharing approach where only one person can take the control and interact with the presented media.

The Facebook View (Figure 3) displays a scrolling list of posts from mutual friends. Similar to Photo View, telepointers are provided to enable users to point and gesture to items on the Facebook list.

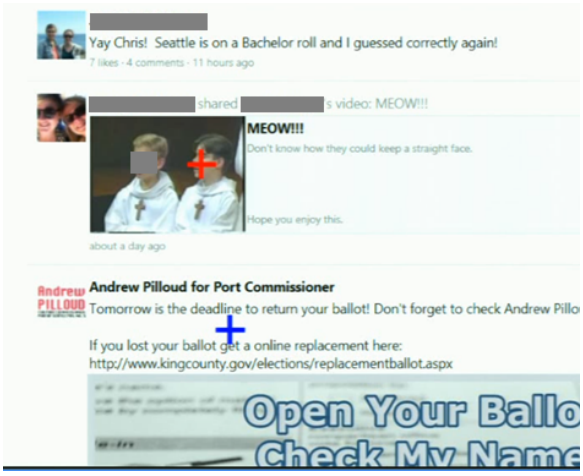

Figure 3.Facebook View app.

4.2.2 Study Design

The study was a within-subject design with 20 participants. Ten participants were recruited through a centralized recruiting service at our company and each person was asked to recruit a friend or family member as their study partner. To be eligible for the study, participants needed to be Facebook users, be Facebook friends with their partner, have at least 10 mutual Facebook friends, and talk to their partner at least once a week (either in person, on the phone, or via video).

All 10 pairs of participants were from the Puget Sound area (10 female, 10 male) between 23 and 66 years old. Three pairs were Female-Female (2 were friends, 1 was mother-daughter), 4 were Female-Male (2 were friends, 2 were couples) and 3 were Male-Male (friends).

4.2.3 Preparation

Before the study, we asked each participant to select ten photos that they would like to talk about with their study partner. Half of the photos were supposed to be about both people such as a shared event, a common interest, or mutual friends. The other half were supposed to be about something the participant wanted to show the other person.

We were aware that because of the nature of the lab study, the situation might be different from an actual video call. In order to make it more similar to an actual video or phone call, we asked them to preferably arrive independently and not talk together the day before the study.

We counterbalanced the four conditions (Skype Only, Photo Sharing, Facebook Sharing, Browser Sharing) using a partial Latin square design, which resulted in four different orderings. Each pair was given 10-minutes to experience each condition and was then moved on to the next condition. All sessions were video recorded for later analysis.

4.2.4 Procedure

Participants were welcomed by two researchers, given a short summary about the study, and placed in separate rooms. A Skype video call was established and used for the whole session while the relevant prototype features were described at the beginning of each section. After 10 minutes, the participants were interrupted to answer a questionnaire and the next condition was set up. After completing all four conditions, the participants were given a final questionnaire to evaluate all four conditions together. They were instructed to converse over Skype and use the prototype as much

or as little as they desired. However, all participants kept communicating over Skype for the whole time of all sessions and used the prototype for the whole time of three sessions that they had it available.

4.2.5 Questionnaire

We used the modified Affective Benefits and Costs of Communication Technology (ABCCT) questionnaire [40] for the purposes of our study. The ABCCT is designed for assessing long-term field studies. To use it in the lab study we eliminated several questions that were not relevant in this context and slightly reworded some others. The resulting questionnaire consisted of 23 questions to measure four "benefit" scales including emotional expressiveness, engage and play, presence in absence, opportunity for social support and two "costs" scales including unmet expectations and threat to privacy.

We also asked the participants whether adding these features to a video call would increase their usage in terms of making more or longer calls. At the end of the study we also asked participants to rank each condition in terms of enjoyment, emotionally connection, and usefulness.

4.2.6 Exit Interview

At the end of each session we had a short (15 minute) unstructured interview with both participants together during which we asked about their opinions, experiences and the challenges they faced during each condition.

5. RESULTS

In this section we combine the results of the survey and lab study, grouped by themes.

5.1 Emotional Connection

Sharing media during a call can be more emotionally engaging than a call without media sharing. 48% of survey participants who had experienced viewing media with someone during a call believed that this practice increased the emotional connection of the call (Figure 4).

Likewise, several survey respondents expressed the emotional impact of sharing media during a call:

> *"It makes the calls more emotionally involved due to being able to see and discuss what we are viewing."* [Survey P100]

> *"[Sharing media] made the call deeper emotionally, enhanced the overall depth of the conversation."* [Survey P60]

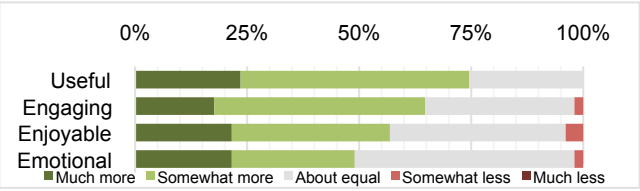

Figure 4. Responses to the survey question, "In the last six months, how _____ was it when you viewed and discussed a media item during a phone or video call, compared to not sharing?" (n=51).

In our lab study, 15 of 20 participants ranked the media sharing conditions as the most "emotionally connecting." Ten ranked the Photo condition first, four ranked the Browser condition first, and one ranked the Facebook condition first (Figure 5).

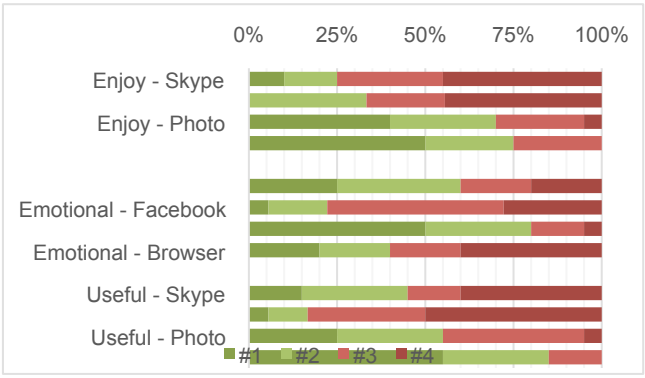

Figure 5. Responses to the lab study final questionnaire ranking the four conditions on three aspects (n=20).

These findings are in line with findings in [21], [31] and [37]. Macaranas et. al. showed that remotely watching video during video mediated communication provided a strong sense of connection and co-presence [21]. Weisz et al. in [37] found that watching media synchronously with others promotes connection and people feel closer to the remote person. Shamma et. al. found that simultaneous video sharing online in addition to the ability to communicate through text messaging or video chat can help people feel togetherness while being apart and support feeling of intimacy and closeness [31].

Observations from the lab sessions suggested that the most emotionally meaningful moments came from storytelling and reminiscing that was triggered by the shared media. Some stories were directly related to the media, while others were triggered by the media but only tangentially related to it.

Although very little emotional storytelling was observed in the Browser condition, it was especially apparent in the Photo condition, and to a lesser extent in the Facebook condition. As one survey respondent commented:

> *"We were able to reminisce about a point in our lives together."* [Survey P158]

In fact, one of the most touching moments was in the Photo condition when one participant shared a Google Street View photo of her grandparent's house in Hawaii (Figure 6). This photo and the stories it triggered for both her and her partner evoked strong emotions in both women.

> *"Your grandfather's house - I had never physically seen it but I could also see the emotion you put into it. And that's where the emotion came in – because of the car. That's your dad's car, and your dad's been passed away for quite a while. I picked up the emotion – are you going to cry? I'm sorry – that came along with the pictures."* [Lab P1b]

While there are many ways to share photos asynchronously online, the combination of synchronous communication with media sharing seemed conducive to storytelling and reminiscing.

One lab study participant said,

> *"I would prefer video and pictures because I liked seeing her reaction when she looked at the picture, because you can take a picture of anything but what is the real reasons behind those pictures, so we were talking about that and I liked that part and we understand why we took that picture."* [Lab P1b]

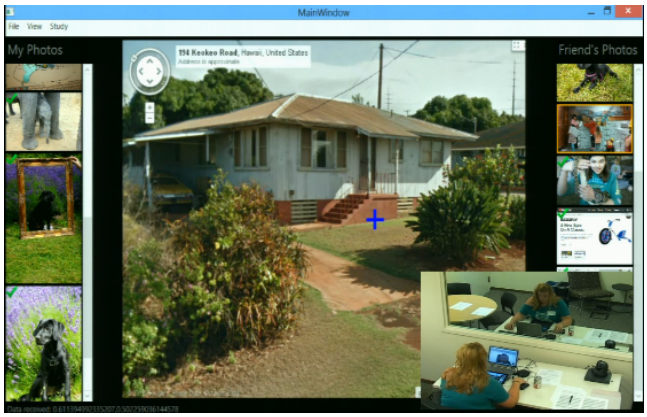

Figure 6. During the Photo condition, one participant showed a Google Street View screen shots of her grandfather's house to her study partner.

> *"A lot of things are missed during text, or they can be misinterpreted, but when we have the face, the expression and there is also the energy that is transmitted."* [Lab P2b]

Many of the stories were reminiscent of a shared event, while others were stories about events that only one of the participants experienced. Both types appeared engaging for the participants. Many participants liked the fact that they were able to reminisce about themselves, things that they had done together, as well as share about their friends and family members. Sometimes this reminiscing could lead to planning for repeating the mutual memories. For example, after viewing a photo showing one participant swimming with dolphins on a trip that both study participants experienced, they started to reminisce about that trip, share stories about dolphins and then started planning another trip together.

This value of reminiscing is echoed in previous work by O'Hara et al. [29] who also found that synchronous photo viewing provided opportunities for people to share their stories, talk about themselves, reminisce, show empathy. It also helped augment emotional bonds between people in the context of adding media to a mealtime.

In addition, the personalized nature of the photos shared during the lab study was another factor that added emotional impact. Participants knew that their study partner selected these photos particularly to show to them as opposed to sharing them in social media where photos are chosen for a larger audience.

> *"I was really interested to see [my study partner's] pictures and what he would bring because I knew that they were really important to him because he picked specifically those ones to show me."* [Lab P9a]

> *"The way she picked up certain pictures in our history was great, selecting it beforehand made it special because it wasn't like browsing my [Facebook] feed."* [Lab P9b]

The Facebook condition also evoked some emotional moments as posts prompted reminiscing and storytelling. However, participants ranked the Facebook condition as the least emotionally engaging by far (Figure 5). In fact, the spontaneous and less personalized nature of Facebook posts by mutual friends changed the nature of the conversation to gossiping rather than personal emotional stories.

The Browser condition had very few instances of storytelling or reminiscing. Sharing some activities such as trip planning created some opportunities for storytelling or reminiscing about the previous similar experiences but most engagement took the form of exchanging information, so it didn't evoke emotional connection that much. As one lab study participant commented, the somewhat generic activities they did in the Browser condition made them feel emotionally disconnected.

> *"It was the most fun and open but it was emotionally disconnected us, if my study partner was worried about something, I wouldn't be able to tell."* [Lab P9b]

Insight: Sharing media especially photos during a call create opportunities for emotional connections by triggering storytelling and reminiscing.

5.2 Emotion and Visual Attention

Interestingly, the emotional expressiveness scale in the ABCCT questionnaire used in our lab study revealed that the Skype Only condition was rated higher than all of the other media-sharing conditions. However, this section of the questionnaire is comprised of questions related to users' ability to read emotions over the communication system [40]. From this perspective, media sharing introduces the potential for divided attention, likely diminishing the participant's focus on their partner, making it harder to interpret their facial expressions. As one survey respondent noted:

> *"The focus would be on the 'media item' and not the conversation."* [Survey P124]

Another lab participant commented that:

> *"Anytime that anything was in front of us even the Facebook that [had] given us something to talk about, I did pay attention less to my study partner but during video talk I was reading her emotion and I felt more connected to her ..."* [Lab P9b]

However, the Photo and Browser condition appear as strong as the Skype Only condition in the ABCCT Presence-in-Absence scale, which is comprised of questions about feeling increased emotional connection with their partner through the communication technology. In addition, the Photo condition stands close to the Skype Only condition on the Social Support scale. This feeling of Presence-in-Absence provided by shared visual context has also been found in [4] and [31].

This suggests that the shared media adds a degree of emotional connection that compensates for the reduced ability to read facial expressions. One of the lab study participants expressed feelings of co-presence engendered by the Photo condition.

> *"It was like I'm here with you with the photo" (posing as she has a photo album in her hand showing it to her friend who was her study partner).* [Lab P2b]

Insight: Sharing media draws visual attention away from video, but this is made up for by the addition of triggers for emotionally significant topics.

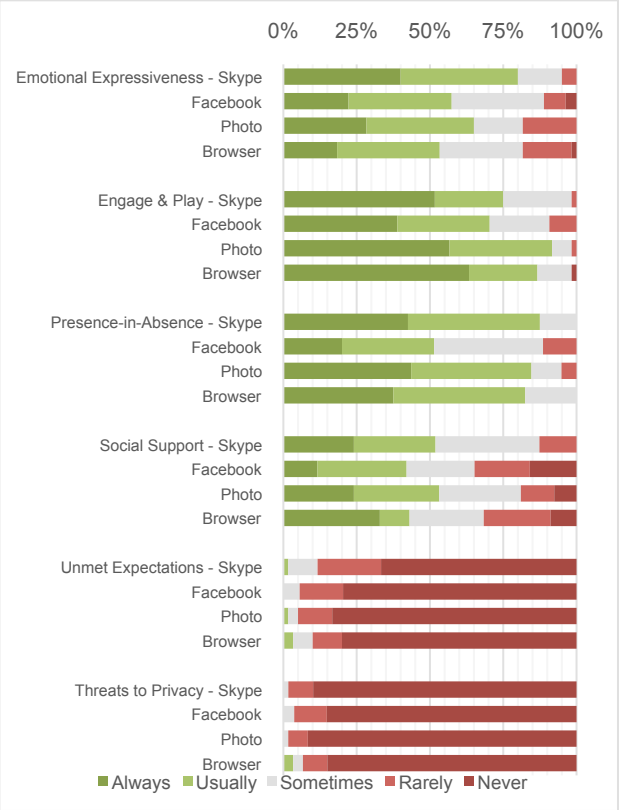

Figure 7.Lab study responses to the ABCCT questions.

5.3 Utility of Media Sharing

The usefulness of media sharing is what was most apparent to our survey and lab study participants. 54% of our survey respondents had shared media during a phone or video call in the prior six months. 73% of this group responded that sharing media made the call more useful compared to a call where no media was being shared (Figure 4).

We asked our lab participants to rank the usefulness of each prototype that they used during the study from best (#1) to worst (#4) (Figure 5). Adding media to a call appeared to greatly enhance the utility of video-mediated communication as only three of 20 participants ranked the Skype condition as the most useful. The most useful condition was the browser, with 11 of 20 participants ranking it first, while six ranked it second.

Many of our lab study participants mentioned the open nature of the Browser condition and the variety of activities that they could do together as an important reason for preferring it.

> *"It was my favorite because you could do anything, for example my daughter is going to get help from your husband [referring to her friend and study partner],they can talk and have the math work, go to this web sites or go to the others, where you can find a math help."* [Lab P1b]

This result is consistent with findings in [15] and [17] that indicate that people wants to do activities during a video communication.

In addition, the flexibility of the Browser condition introduces the potential to support the need of single, multi-purpose integrated design for sharing media.

> *"I would spend more time on this because you can also share pictures on that"* [Lab P2a]

Our lab participants were allowed to choose any online activity for Browser condition. We observed several different shared activities, categorized as follows: entertainment, information seeking, show and tell, activity planning and shopping.

Interestingly, the most common activity was watching humorous videos together. In some cases one participant played a YouTube video he had seen before to show to his study partner or they browsed collaboratively for funny YouTube video not already seen. This finding supports Macaranas et al. [21], who found that watching TV with someone remotely is engaging and fun.

Some categories such as activity planning and shopping, benefited more from augmenting by audio and video communication channels because the other person's feedback seemed more necessary.

> *"I wanted to buy a birthday gift for her kid so we could browse together and at least I could have a visual idea what to get for her."* [Lab P1b]

Insight: Sharing media adds utility over a normal call. The shared browser is particularly useful due to its flexibility.

5.4 Tool Usage

People who share media during a call today for domestic purposes are doing it by repurposing existing technologies, e.g., sending media (or links to it) via a messaging system. People sharing media in this way do not have the benefits of a WYSIWIS experience or the ability to point and gesture, and must do all co-navigation and deixis through voice. There are some tools where users can interact via multiple media types but as these features have not been proposed and integrated into domestic video chat applications, they have been rarely used by a general audience during a home video conferencing session.

Our survey results show that a minority of respondents (35%) have used screen sharing for media sharing, however, most screen sharing tools do not provide shared control or telepointers.

Through interviews, our participants indicated several desired practices of sharing media during a call, which are not supported by current technology offered in video chat application. These mainly included the ability to have two-way, mutual interaction with the media as well as synchronous manipulation. As a result, extra effort and some intuitive techniques were applied.
The WYSIWIS approach in our prototype along with two-way simultaneous interaction and ease of use was appreciated by some of our lab participants. As one lab participant commented:

"No extra effort was needed, clicking back and forth was great it wasn't like oh go to this link or open this file, everything was there and I could scroll and see what she was talking about or queue up the next one." [Lab P9b]

Another lab study participant compared the ease of the shared web browser to browsing in parallel on separate computers.

> *"We both wanted to look at the cruise and she wanted to show me a ship that she had researched on, and sometimes when the website has many different places to go then it is easy to get lost, when you are talking on the phone and talking about the web site even if you are on the same web site you might not see the same screen so that's kind of cool when you say oh this is so cool you see what she is talking about."* [Lab P5a]

Insight: Media sharing during a call is currently not well supported because of lack of two-way simultaneous interaction.

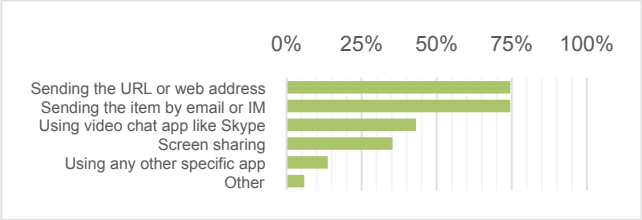

Figure 8. Responses to the survey question, "Which tools have you used to view media together during a call?" (n=51).

5.5 Enjoyment and Increase in Usage

Of the 51 survey respondents who had prior experience sharing media during a call, 65% found the experience more engaging and 57% enjoyed the call more when they viewed or discussed media (Figure 4). One respondent said,

> *"It just made it a lot more fun, didn't have those awkward silences and made the call more worthwhile."* [Survey P122]

These results are consistent with findings in [21] and [37]. Macaranas et. al. found that the communication enhanced the enjoyment of the content for some participants [21]. Similarly, Weisz, et al. showed that people found it more enjoyable when they have the ability to communicate with each other during the synchronous media watching session [37].

The ABCCT questions in the "Engage and Play" group ask about engagement, excitement, and fun. The lab study participants' responses to these questions were highest for the Photo and Browser condition**s (Figure 7)**

As part of the lab study post-task questionnaire we asked if having a tool that made it easy to have that experience would make the participant call more frequently or encourage longer calls (Figure 9). The results were strongest for the Browser and Photo conditions, though even the Facebook condition had positive responses.

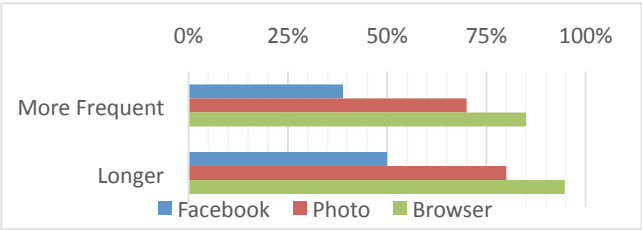

Figure 9: Responses to the lab study questions, "If you had a tool that made it easy for you to have this experience, would it make your calls _____?" (n=20).

Survey respondents echoed the same sentiments:

> *"It would make it a lot less 'Oh, I'll link you this after we're done.' The calls would likely last longer and [would] probably be more fun."* [Survey P24]

> *"I think there would be more calls instead of just messaging each other."* [Survey P122]

> *"If I had a device that could easily do that with my family and friends I would talk to them more about videos or photos, over the phone, than I do now."* [Survey P165]

Although the Skype condition was still engaging for our participants, some of them reported in the interview that it was somewhat boring in comparison to the other conditions. When they were asked about their experience, one participant found the Skype Only session difficult because of the undirected nature of the activity, and believed that her study partner seemed bored because he started to sneak glances at his cell phone although he paid full attention to her in other sessions. [Lab P7b]. We also observed some other forms of boredom in some of our participants such as yawning, looking around and not maintaining the eye contact and playing with some other objects.

> *"Skype was almost the most boring one because we used it and there was no other interaction."* [Lab P3a]

> *"I liked it when we have a mutual goal, the browser stuff or pointing at things on the pictures and we had a task instead of just looking at each other. I think it was fun."* [Lab P8b]

Insight: Sharing media during a call makes the experience more engaging and enjoyable and encourages for more frequent and longer communication.

6. DISCUSSION

Home video communication is not only about exchanging information. In fact, conveying affection is also an important part of communication. Studies show that many of the non-verbal cues that are an important part of showing our emotions, such as gesture and gaze directions are distorted over video link [10][17]. In this regard, sharing media during video conversation could compensate for this shortcoming of expressing our emotions in video chat compared to face-to-face communication. This benefit of media sharing is in addition to the potential demonstrated in our lab study. Here we saw that users are able to share more personal stories and to emotionally connect with others over video chat. These benefits show that there is a clear need to go beyond talking heads in video communication and repurpose video to engage in shared activities. This need is echoed in [4], [15] and [17]. However, there is limited support for shared activities augmented with present-day video communication technology [4]. Our findings further illustrate the synergy between different types of media and communication channels, especially video-mediated communication. Sharing media can enhance video-mediated communication since it can potentially create opportunities for emotional connection, utility, enjoyment and engagement. This shows the importance of augmenting media sharing tools with communication channels such as the telephone and videoconferencing.

We found that media sharing also has a high potential to emotionally connect people during video-mediated communication by triggering story telling and reminiscing. This suggests that video-mediated communication for domestic environments can provide more emotionally support when coupled with media sharing which permits an explicit sharing of life.

Emotional storytelling and reminiscing were apparent in the Photo condition, to a lesser extent in the Facebook condition and very little in the Browser condition. The personalized nature of the Photo condition and preparation made each users feel very special to the remote person and increased the emotional content of the conversation as a consequence. This suggests providing a secure personalized shared space attached to each contact in the video chat contact list where users can upload photos, videos or any

other media specified for that person. Such design features would be desirable and provide more opportunities to share life moments in the middle of conversations.

Colsey et al. in [7] showed the potential value of Facebook content including status updates and wall posts for reminiscing. Similarly, we showed that social networks such as Facebook can support reminiscing and emotional connection during video-conferencing by focusing on one's personal 'stuff' and on a limited circle of his close mutual friends and family. In this regard, integrating some mutual interests from social media in the video chat application could also offer several reminiscing opportunities and conversation topics and lead to more enjoyable communication.

While Harboe et al. speculate that the combination of video chat and audiovisual entertainment such as a TV program will be distracting [12], Macaranas et al. found that augmenting synchronous watching with video-mediated communication does not cause divided attention [21]. However, we found that media sharing introduces the potential for divided attention. Diminishing the user's focus on the remote partner is seemingly inevitable in current practices of synchronous media sharing, since users usually have to minimize their video chat application and open the attached file. Even in screen sharing, only one person has the control for the video feed window. In addition, this concern of drawing visual attention away from the partner to the media was echoed for our participants who found that they did not pay enough attention to their remote partner. This cost suggests that in future design for sharing media during a video communication, space should be divided equally between the video feed and media presentation space.

Despite this drawback of diminished focus, we found through our lab study that that Photo and Browser conditions provided the same level of Presence-in-Absence as Skype by itself. This result is similar to findings in [4] and [31] that showed shared visual context during video chat can support a feeling of co-presence. Thus the emotional connection provided by media is strong enough to compensate for the distraction that occurs when media is added.

Beyond the emotional connection it provides, sharing media adds utility over a normal call. Several studies have shown the importance of video as data in work environments [3][4]. Kirk et al. [17] saw the benefit in integrating messaging with utilities like file sharing and web browsing. 73% of our survey participants believed that sharing media makes the call more useful. This result shows the importance of integrating sharing media with audio and video communication channels with more features for collaboration and interaction. In our lab study, we also found that media including Photo and Browser have the potential of adding utility to a domestic video communication. However, Facebook was not successful in enhancing the utility of the Skype call. The open nature of the Browser condition and its flexibility, provided the opportunity for a variety of shared activities while the communication channel created a suitable environment for collaboration, better decision making and the exchange ideas about a mutual shared goal. These findings demonstrate the value in providing a multi-purpose, flexible, collaborative and personalized environment that enables users to do a wide variety of online activities together for different purposes such as entertainment, education, information seeking, show and tell, activity planning and shopping.

Despite the fact that people rated the Skype Only condition as being very engaging and enjoyable, we observed several signs of boredom in our participants during the Skype Only condition. Such behaviors were never observed in other conditions. Thus, according to our data, Photo and Browser- sharing could engage participants to the same extent as Skype, and possibly more so. According to our observations, participants enjoyed Photo and Browser sharing to a greater extent than the Skype Only condition. The Facebook condition provided the same level of joy as the Skype Only condition. This higher level of enjoyment that media encourages can potentially lead to more frequent and longer communication between people. This possibility shows the importance of embedding media sharing in designing future communication tools for distance-separated families, especially for young children and teenagers who lack communication with their families, which may make them emotionally disconnect from their remote family members.

Sharing media could help to facilitate conversation and could be a good catalyst for reducing awkward silences and providing context for those that like to chat but may not always have something to say.Yet it is unlikely that more frequent and longer calls are desired by all demographics especially those that have enough in-person contact on a daily basis, but it could be regarded as an asset for those family and friends that lack communication exchanges. Providing an easy and accessible platform for sharing daily life in a call could facilitate being a part of daily life of each other and support more feelings of togetherness.
Regardless of all of these benefits that augmenting media sharing can offer to video-mediated communication, media sharing is currently not well supported in this type of communication. Sharing the exact same experience needs a WYSIWIS design that also supports simultaneous, mutual two-way interactions.

We also evaluated the costs of adding media to a video call in two scales: unmet expectations and threat to privacy. We did not find any considerable costs compared to the Skype Only condition.

7. LIMITATION

While valuable, our research also had several limitations. We believe that we would have more detailed data about the long-term real practices of media sharing during calls if we had done a field-based study. In addition, we are also aware that a lab study and associated observations may cause behavior changes and may not be truly indicative of actual practices. Participants may have also felt pressured to think of something to talk about. This could have affected their communication. More importantly, the solitary nature of a lab study versus the group nature of home video communication might also change the media sharing practices during a call.

In addition, for this work we were more focused on the benefits of adding media to a video call than potential drawbacks. Trying this approach in an everyday situation could reveal drawbacks such as feelings of obligation to share personal data during a conversation. We will focus on this drawback in our future work.

Our purpose was to explore the benefits of adding media to the video communication channel as a way to foster social bonds rather than just communication information. We feel that by integrating these two existing technologies, future communication applications can provide greater benefits to users.

8. CONCLUSION

Our survey and our lab study show that media sharing in video mediated communication is desirable because it is useful, emotionally fulfilling, and enjoyable. It establishes common ground for participants in the call. We found that people have a

desire to share the experience of viewing media together during a video chat. However, this practice is not well supported in the current communication systems. The results from our work demonstrate that shared browsing fulfilled utilitarian needs, while sharing photos supported emotional connection.

We also found that audio or audiovisual calls are enhanced by viewing media in terms of increasing users' enjoyment and sense of connectedness. We also learned that viewing media during a call can add significant values in terms of usefulness. Our participants felt that adding media to calls would encourage them to make more calls, and have longer calls.

Our study also revealed that people want to share many different activities during a call. The collaborative and open nature of shared browsing during a call made the call very useful in comparison to regular calls.

Adding media to a call increased the emotional content of the call and made it more engaging and exciting for remote users. In addition, adding media often triggers more stories, which supported emotional connections between users. We believe that this emotional connection is strong enough to compensate for the distraction that occurs when media is added.

Considering the benefits of and desire for sharing media during a call, we believe that this integration of technologies is an area that is worth investing in future audio/video chat applications.

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