The Uses of Personal Networked Digital Imaging: An Empirical Study of Cameraphone Photos and Sharing

The Uses of Personal Networked Digital Imaging:
An Empirical Study of Cameraphone Photos and Sharing

Nancy Van House, Marc Davis, Morgan Ames, Megan Finn, Vijay Viswanathan
University of California at Berkeley
School of Information Management and Systems
102 South Hall, Berkeley, CA 94720-4600
{vanhouse, marc, morganya, megfinn, vijay}@sims.berkeley.edu

ABSTRACT
Developments in networked digital imaging promise to substantially affect the near-universal experience of personal photography. Designing technology for image capture and sharing requires an understanding of how people use photos as well as how they adapt emerging technology to their photographic practices, and vice versa. In this paper, we report on an empirical study of the *uses* made of a prototype context-aware cameraphone application for mobile media sharing, and relate them to prior work on photographic practices. By reducing many of the barriers to cameraphone use and image sharing (including increasing image quality, easing the sharing process, and removing cost barriers), we find that users quickly develop new uses for imaging. Their innovative communicative uses of imaging are understandable in terms of the social uses identified from prior photographic activity; new functional uses are developing as well.

Author Keywords
Cameraphones; photography; social uses of photography

ACM Classification Keywords
H.5.2 User Interfaces: User-centered design; H.5.2 User Interfaces: Human factors.

INTRODUCTION
Virtually everyone is in some way affected by personal photography – as photographer, subject, or viewer. Personal photography is of great importance to many: as a record of important life events, of children's growing up, and of daily life. Among the few things that people rush to save when their houses burn are their photos.

We argue elsewhere [3] that cameraphones will soon be the dominant platform for low end consumer digital imaging. We argue here that, to design cameraphones, networked digital imaging devices, and the associated applications to be useful and usable, we have to understand how cameraphone imaging both fits into existing photographic practices and facilitates new practices. Elsewhere [10] we present our approach for understanding the *social uses* of personal photography. In another paper [3], we report on the development of a *technology* for context-aware mobile media sharing, the MMM2 system. Here we report on the *uses* made of the system and relate them to prior work on photographic practices.

This project is, in essence, a small experiment demonstrating how people may use digital images when they have a camera always-at-hand, with minimal barriers to personal use and sharing of photos. Here we present our empirical findings from the first six weeks of a relatively large-scale (60 participants) six-month study. We report on the emerging uses and consider how these articulate with what we know about photo use in general from our and others' prior research. These findings, while preliminary, suggest that ubiquitous networked digital image-capture and sharing may substantially change the ways that people use personal photography – potentially, we would argue, the most radical development in photography since the film camera made personal photography possible.

RELATED WORK
Personal photography has been addressed in visual studies (e.g., [2, 9]). The uses of digital photography have been addressed by, among others, [1] and [4]. Koskinen [6] provided users with prototype devices for taking, sending, and receiving photos. Kindberg et al. [5] interviewed 34 subjects in the US and the UK about using cameraphone images to communicate with people not co-present. Our earlier work [10] was an empirical examination of current personal photography practices. Considerably less research has been done on cameraphones This study continues our examination of social uses, this time in the context of networked cameraphones.

THIS STUDY

The System
We gave 60 participants Nokia 7610 cameraphones, which include one-megapixel cameras with four-stage zoom and a night mode; respondents found the image quality generally quite acceptable in daylight, though not quite as good in night mode and at extreme zoom. They also had free, virtually unlimited voice and GPRS service via AT&T/Cingular.

The cameraphones were loaded with our MMM2 application [3]. MMM2 automatically uploads the image to the MMM2 system, where each photographer has a website where images can viewed, captioned, and organized into "albums." Images can be shared with other MMM2 participants, or with anyone with email, either directly from the phone at time of capture, or from the website (accessible from the phone or from a computer). Recipients receive a URL and, in their email, a thumbnail. Once uploaded, an image can be treated like any other JPEG.

This system reduces several important barriers to cameraphone use and image-sharing identified in our interviews. Image quality is better than the usual US cameraphone. Service was free to participants, and giving them all the same phones and sharing system eliminated problems of interoperability and compatibility. Phone Recipients get URLs, not images, eliminating the sender's uncertainty about the cost to non-MMM recipients and reducing intrusiveness. Many non-MMM cameraphone users reported not knowing how to transfer images off their phones: MMM2 does this automatically. Finally, the MMM2 website supports image management.

The Subjects
Participants were 40 first-year graduate students in the School of Information Management and Systems (SIMS), aged approximately 22 to 35, plus 20 other people, mostly SIMS faculty and second-year graduate student researchers. The students were all taking classes together and working collaboratively on class projects. They also socialized.

While this is, of necessity, a constrained and somewhat artificial group, they have strong motivation for sharing (for both work and for social reasons), plus high degrees of common ground, technological readiness, and collaboration readiness, identified by [8] as critical for technology-mediated collaboration. As SIMS graduate students, they are inclined toward technological experimentation, but also astute about technology.

Before the cameraphones were distributed, we conducted a focus group of nine students who were prior users of cameraphones. Once students began using the devices:

- We interviewed ten students about cameraphone use, asking the kinds of images they were taking and why, what they were sharing, with whom, and why, and how this differed from their prior photographic practices.

- We interviewed three student developers of the MMM2 technology. They were heavy *users* of the system, understood its capabilities, and had used it longer than the other subjects. We were interested in how uses might mature among longer-term, heavy users. We scrolled and discussed the images with them; they each had between 300 and 700 images in the system.

- As participant/observers, we are not only using the cameraphones ourselves, but, as members of a close-knit academic unit with the other cameraphone recipients, we are continually receiving (and sending) photos; we're present when pictures are taken; and participants share with us anecdotes about (and images of) notable photographic events.

- We are continuing to interview others participants and are examining their images with them; we will report on this at the conference.

Our interest is not in quantitative descriptions of use (which would not be statistically valid representations of any larger population anyway) but in qualitative research aimed at understanding the emergent uses in an interconnected, technologically-inclined community.

FINDINGS: PHOTO-TAKING AND SHARING
Cameraphones show us what people do when photography can be a daily activity, not requiring forethought in carrying a camera. During the first six weeks of the project, participants uploaded nearly 1500 personal photos, averaging one per person per day.

While no baseline data exist on personal photographic practices, and existing research like Chalfen's [2] is dated by changes in technology, we conclude, along with others [5, 7], that cameraphones change the definition of what's photo-worthy from what's special and enduring to what's often transitory and ordinary.

Our participants are taking many "ordinary" photos: family and friends, kids, and travel – the convenience and spontaneity of cameraphones often compensate for the reduced image quality (which is better than most cameraphones). In addition, cameraphones encourage frequent, spontaneous photos. Many of the photos taken are friends in class or at parties; humorous sights; aesthetic experiences (e.g., a rainbow). Several people reported taking pictures when they had down time to fill.

Sharing is an important use of photos {2, 10]. The MMM2 system makes internet-based sharing easy. Participants share a high proportion of their photos via MMM2: 57% of all personal photos and 75% since the introduction of a sharing recipients guesser [3]. Most share with a limited pool of others—within or outside of SIMS—often on specific topics. For example, two people reported a running habit of sharing pictures of their cats. Additional photos are shared via more traditional ways such as email. (The technology necessitates that MMM2 automatically upload and delete photos from the phone, making face-to-face on-phone sharing unlikely.) Users quickly came to take the sharing function for granted, and complained vociferously when it was interrupted.

THE SOCIAL USES OF CAMERAPHONE PICTURES
In earlier work [10], we identified a set social uses of personal photography: creating and maintaining social relationships; constructing personal and group memory; self-presentation; and self-expression. Kindberg et al. [5]

Social relationships	Personal and group memory	Self-presentation	Self-expression	Functional, self	Functional, others
Family	Party	Self-portrait	Argh!	Good wine	Deadline reminder

Figure 1. Social Uses of Images

developed a taxonomy of reasons for cameraphone image capture along two major dimensions: "affective" versus "functional," and "social" versus "individual." In general, our earlier [10] discussion of social uses is more detailed and nuanced than theirs; the functional uses that showed up in their and our cameraphone research did not show up in our study of more "traditional" photography.

Using both our and Kindberg et al.'s taxonomies as starting points, we identified among our respondents the following uses of cameraphones' imaging capabilities when coupled with easy uploading and sharing.

Creating and Maintaining Social Relationships
In earlier research, we learned that photos can be very important in social relationships. The content of photos shows who is part of the group. Photos are often given as gifts, which reinforces connections. Sending photos to distant others is a way of keeping up on one another's lives. Telling stories about photos helps nurture relationships.

We saw similar uses for these photos. Many pictures were of fellow-students: in class, in work groups, at parties; these images were often shared with the people in them. Many shared images that on the surface seemed informational were, on examination, more about reinforcing the social relationship. The images often seemed to say "I'm thinking of you" or be a shared, often running, joke.

Cameraphones also made connection with distant loved ones easy. One student sent pictures of her daily life to family, for information, but, even more, for connection. While any kind of camera could take these pictures, she mostly sent casual, spontaneous cameraphone photos of her everyday life and sights (e.g., a picture of a tree with fall leaves sent to family where it was snowing).

Earlier [10], we found that people generally preferred synchronous, face-to-face photo sharing when possible The conversation around photos was important both for reinforcing the relationship and for allowing the photographer to contextually shape each viewer's understanding of the image. Although repeated frustration voiced with cameraphones was the inability to talk and share images simultaneously, cameraphones are useful for synchronous, distant sharing. One parent sent pictures of his daughter directly from the phone to her grandparents because he said there is **"**something kind of immediate

about it, this is where [my daughter] is now. Students sent friends real-time images from events like concerts. The MMM2 website allows and shared image viewing. One person embedded URLs in instant messages so that her correspondent could see the image. Another talked on the phone with friends while they viewed his images online.

Personal and Group Memory
A major use of photos is as a record and reminder of individual and collective experiences, and to share experiences with others, such as using family photos to give children a sense of family history. These uses are often heavily loaded with emotional significance.

Students took many pictures of their daily life, activities, and friends. One person who called himself "not a photographer" now has an extensive collection of pictures of his everyday life that he described as "a conversation with myself." The casual nature of these pictures (one person took pictures from the back of a motorcycle) and the ease of managing large numbers with MMM2 gave this a lightness. People spoke of enjoying having a record of what they've been doing, without the sense of obligation with which earlier respondents talked about managing (more often, failing to manage) their photo collections.

Self-Expression
Self-expression is about giving voice to one's unique view of the world. While none used the word "art," participants showed us many images whose primary value to them was aesthetic. Again, the ease and low cost of imaging, and the spontaneity the perceived casualness of the cameraphone encouraged experimentation. Even the device's limitations were turned to advantage: some used the blurring common in the night mode to create expressive images.

Self-Presentation
Self-presentation is about influencing others' view of oneself; for example, through self-portraits, pictures of one's friends, possessions, personal space, and so on. Cameraphone images of oneself were seen as more frivolous and less pretentious than "regular" photos.

Functional: Self and Others
Cameraphones are used for functional images, a category that did not appear in our research on more traditional photography. With the increased image quality,

cameraphones can sometimes be used in place of writing, copying, or scanning. More than one student showed us readable pictures of their workgroups' whiteboards.

Images can convey complex information succinctly, especially among people with common ground [8]. One person sent images of a clock to remind his workgroup that time was running out on their project—more gentle than nagging. A student sent a faculty member an image showing how many class members showed up for a tutorial. Another took surreptitious images of people in a public space for an ethnographic fieldwork paper.

Other Observations
Cameraphone pictures were often seen at the time of capture as transitory. However, many respondents reported that, once they had taken the photos, they became "attached" to their photos. Initial problems with the system sometimes resulted in lost images, which people found distressing. Dropped calls, common with mobile phones, can be re-connected; lost images are irrecoverable.

DISCUSSION
Our social uses approach emphasizes the purposes and reasons for photo taking and sharing, and the role of new technology in supporting enduring goals. Our contention is that we can better predict and design for specific uses if we understand the higher-order activities they support.

We are early in an on-going study. We have collected data from a portion of our users, and this is a specialized group. By removing barriers to use, this study does not represent "real world" use where cost and interoperability remain issues. Nevertheless, we believe that these findings indicate what cameraphone use is likely to become as image quality improves, networking increases, barriers are reduced, and the devices become ubiquitous.

It appears that, with a camera always at hand and easy viewing, uploading, and sharing, photo-taking becomes for many a frequent, even daily, activity. Subjects found new ways to use images for enduring social uses (such as communicating with loved ones) as well for activities for which photos were not previously used (e.g., reminders).

We also believe (from this study and an associated on-going study of photoblogs) that we are seeing an increase in photographic self-expression. Ready access to imaging encourages people to see the world "photographically" – as images, and to see beauty and interest in the everyday. And easy internet-based sharing creates an an audience.

To support these uses, ease and speed are critical. Image quality needs to be "good enough." Some of our heaviest users were fairly serious photographers willing to give up *some* quality for convenience. The slowness with which the Nokia powered up and it and MMM2 cycled between photos was often cited as a frustration.

One value of a study like this, which combines relatively large-scale prototype implementation with user studies aimed at understanding not just *what* people do but *why,* is that we can rapidly iterate findings and design, as reported elsewhere [3]. We contend that this orientation is useful for technology design generally, not just imaging.

We are continuing to study these participants as the novelty of the technology wears off. We are working to extend MMM2 to other kinds of users. As the technology improves—both MMM2 and cameraphones and the cellphone networks—continued research should yield new insights, not only into technology use, but also into people's uses of images in their lives.

References
1. Balabanovic, Marko, Chu, L. L., and Wolff, G. J. Storytelling with digital photographs, in *Proc. SIGCHI 2000*, ACM Press (2000), 564-571.

2. Chalfen, R. *Snapshot Versions of Life.* Bowling Green State University Popular Press, Bowling Green, OH, 1987.

3. Davis, M., Van House, N. A., Burgener, C., Perkel, D., King, S., Towle, J., Ahern, S., Finn, M., Viswanathan, V., Rothenberg, M. MMM2: Mobile Media Metadata for Media Sharing, *Ext. Abstracts CHI 2005,* ACM Press (2005).

4. Frohlich, D., Kuchinsky, A., Pering, C., Don, A., and Ariss, S. Requirements for Photoware, *CSCW 2002 Proc.,* ACM Press (2002), 166-175.

5. Kindberg, T., Spasojevic, M., Fleck, R., and Sellen, A. I saw this and thought of you: some social uses of camera phones, *Ext. Abstracts CHI 2005,* ACM Press (2005).

6. Koskinen, I., Kurvinen, E., Lehtonen, T.-K. *Mobile Image.* IT Press, Helsinki, 2002.

7. Okabe, D. and Ito, M. Camera phones changing the definition of picture-worthy, *Japan Media Review* (2003).

8. Olson, G. M. and Olson, J. S. Distance matters. *Human-Computer Interaction*, *15*, 2-3 (2000) 139-178.

9. Prosser, J. *Image-Based Research: a Sourcebook for Qualitative Researchers.* Falmer Press; Bristol, PA, 1998.

10. Van House, N. A., Davis, M., Takhteyev, Y., Ames, M., Finn, M. The Social Uses of Personal Photography: Methods for Projecting Future Imaging Applications, 2004. http://www.sims.berkeley.edu/~vanhouse/vanhouseetal2004b.pdf