



# **The Social Life of Snapshots**

## **The Past, Present, and Future of Personal Photography**

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## Abstract

Digital cameras, cameraphones, online sharing, and other innovations are expanding the ways we interact with photographs. This study examines the past and present social uses of personal photography and reports on an investigation into possible future uses of cameraphones and online/mobile image sharing. We conducted 57 interviews with 51 participants and carried out a 10-month investigation of cameraphone use in a group of 70 strongly-connected participants, all on the west coast of the United States. We found that cameraphones are interpreted as three devices in one: they are *memory-capture* devices, *communicative* devices, and *expressive* devices, with the third being dominant. Traditionally, cameras were primarily memory-capture devices, especially in family photography where the most research has been done. To balance tendencies toward technological or social determinism, we use concepts from Activity Theory and the Social Construction of Technology in our analysis. We compare our results to those of researchers doing similar work in Japan and Finland.

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## Introduction

Photography has grown in the last century from a curiosity to a pervasive practice that engages us all as photographers, subjects, and viewers. Photographs are important in many parts of our lives, and personal photographs in particular have deep and lasting importance to us. “Point-and-shoot” cameras, starting with the Kodak Brownie, triggered mainstream photographic creation and consumption, and snapshots changed the way people remember significant events in their lives and how they define their individual, group, and cultural identities (Chalfen 1987; Musello 1980, 6:23-42).

Recent developments in digital imaging in particular are changing photographic practices in major ways. Cameraphones, with their combination of photographing and messaging abilities, are revolutionizing image production, and online photography sites are revolutionizing image sharing. Preliminary results show that people take many more day-to-day pictures with cameraphones than they do with regular cameras, and that some have a much wider audience than family and close friends in mind when they post online (Ito 2005a; Kindberg et al. 2005; Koskinen, Kurvinen, and Lehtonen 2002; Okabe 2004; Van House et al. 2005:1853-1856). The possibility of daily personal media creation is just becoming known to a large portion of the population. This suggests that the uses of these photographs differ from prints in significant ways that are worth investigating.

Chalfen and Musello explored on- and off-camera behaviors for film cameras in the 1970’s (Chalfen 1987; Musello 1980, 6:23-42), but since then the act of picture-taking has been drastically changed by LCD screens, digital storage, and the ubiquity of cameras (especially in the form of cameraphones). In this paper, I will review previous literature to create a picture of the history of personal photography. I will then report on

the results of our own research, including interviews and an investigation of cameraphone use and sharing using the MMM2 system. I will summarize these results and briefly discuss directions for future work.

A recurring theme in the literature of new media is the significance of taking media production out of the hands of the few and making it available to the many. Kodak's introduction of film cameras was an early instance of this democratization of media creation. Current developments in digital cameras, the Internet, online photo sharing services, and cameraphones are all important elements in a larger shift in content creation and publication.

We found that cameraphones are three devices in one artifact. As *memory-capture* devices, they are used to "capture" memories and construct narratives of self and others. Cameraphones are unique, however, in being widely used to capture mundane images that chronicle the texture and flavor of daily life, as well as special events.

As *communicative* devices, cameraphones are used to communicate with others via images, which often have greater richness and resonance than text. These images are often highly transitory and indexical, with short-term, highly situated meaning and private significance.

As *expressive* devices cameraphones are used to express the photographer's view of the world, especially through humorous and artistic images.

Other researchers have explored cameraphone use in Japan (Okabe 2004) and Finland (Koskinen, Kurvinen, and Lehtonen 2002), and the US and the UK (Kindberg et al. 2005). Most of these studies, for either reasons of technology or methodology, have followed small numbers over a short time. However, cameraphones are embedded in on-

going social practices of photography and communication. We have to ask what factors of culture, life stage, and life conditions interact with images and their uses, and with cameraphones, and therefore to what extent we can make inferences from the populations that have been studied.

In our research, we have conducted 57 interviews with 51 amateur “family” photographers, including digital camera and cameraphone owners, since spring 2004. Thirty-four of these interviews were part of a 10-month investigation into cameraphone use with the common technical and financial limitations removed. In this investigation, we gave cameraphones and online image sharing and management capabilities to a strongly-linked network of people, where we were able to chart the development of norms and practices of imaging and sharing. We followed 70 participants over up to 10 months, during which they took more than 24,000 images.

Our approach, rooted in the Social Construction of Technology (SCOT) (Bijker, Hughes, and Pinch 1987) and Activity Theory (Engeström, Miettinen, and Punamaki-Gitai 1999), investigates the varied meaning of cameraphones as both recording and communication devices supporting a wide range of higher-order activities. Ultimately, we want to understand the current state of everyday photographic practices, including digital cameras, online sharing, and especially cameraphones.

A key problem in technology design is forecasting use. Social science research is best at describing and understanding, but not predicting. We use concepts from SCOT and Activity Theory to try to help us understand current uses in ways that will help us project future uses of emerging technologies. At the same time, we do not focus exclusively on informing future designs in order to not limit ourselves to focusing on the

“problem areas” of photography; we want to develop a complete and thorough understanding of *all* use. Our contention is that the cameraphone is not a single device, but a set of different devices folded into one artifact. Our data show that the cameraphone is multiple devices: a *memory-capture* device, a *communicative* device, and an *expressive* device. Understanding these different interpretations of the artifact and the different social uses that it supports can help us understand current trends and forecast the camera phone’s likely future use as continuations of higher-level activities.

This research also informs a broader question, and one of significant and wide-reaching importance: how are new technologies in general adopted? What do they change about people’s practices, and how are they fit into them? Though these are ongoing, unresolved questions that frame much of my own research, I will touch on them below.

### *My Contributions*

I joined the research team at the beginning of summer 2004, just after the first phase of interviews was wrapped up. In summer 2004 I assisted with five interviews of digital camera and cameraphone owners, most of them with Yuri Takhteyev. I organized and conducted 16 interviews for the first phase of MMM2 investigation in February and March 2005. This spring, I ran the nine follow-up MMM2 interviews. In addition, I have been conducting an ongoing literature review since spring 2005, covering much of the literature related to photography in human-computer interaction, visual studies, anthropology, cultural studies, and critical theory. Finally, I helped write several papers for the ACM Conference for Human Factors in Computing Systems (CHI) 2005 and 2006 and the ACM Conference for Computer-Supported Cooperative Work 2006 (still in review).



## Related Work

The literature on personal photography largely falls into one of two very different camps. On one hand, researchers from cultural theory and the social sciences have explored the intricacies of the “family snapshot” for decades but have largely failed to recognize the changes facilitated by new technologies, or occasionally gloomily (and rather inexplicably) predict the death of personal photography (Lister 1995:1-25). On the other hand, the human-computer interaction community embraces new photographic technologies but fails to offer much analysis or commentary on the deeper social uses and implications of photography. There are a few notable exceptions who bridge this divide, particularly Mizuko Ito (2005), Daisube Okabe (Okabe 2004), Ilpo Koskinen (Koskinen 2004), and Kris Cohen (Cohen 2005, 27:883-901), which I will describe in detail below. Though all studies are naturally incomplete – when can we ever capture the entirety of practices with an object, after all? – they all inform our work in various ways. In particular, the studies on the family snapshot provide a good working picture of how family photography is carried out in the real world and what it all means (or what it meant at the time of the study; the target is constantly in flux).

### *The History and Social Uses of Family Film Photography*

Scholarly speculation on the socio-historical trajectory and social uses of personal photography stretch back to the writings of Walter Benjamin in the 1930s (Benjamin 1931), though most has been produced since the 1970’s. Almost all of this has focused on *family* photography specifically. Richard Chalfen (Chalfen 1987) conducted one of the first thorough social science analyses of family photography, or what he called the

“snapshot.” He broke photographic practice into four events: planning, behind- and on-camera shooting, editing, and exhibition. Christopher Musello extended this framework in 1980 (Musello 1980, 6:23-42) with the addition of processing between shooting and editing, though the role of this in most consumer photography has always been small and has arguably disappeared entirely with digital imaging. More recently, Gillian Rose, Jo Spence, Don Slater, and others have also explored various aspects of family photography. These studies provide us with both a more complete understanding of personal photography and a good sense of *how* to do research on photography. In particular, Gillian Rose has also written about visual methodologies (Rose 2001).

Richard Chalfen

Chalfen has studied family film photography sporadically over the last thirty years. The long timeframe of his studies provide some insights into changes over time. He has explored various aspects of personal photography, including the cultural symbolism in photographs, teenagers’ feelings on photography and video, and the role of photographs as “evidence” in various personal and public settings. His framework and detailed insights provide us with a foil to which we can compare our own findings, both with film and digital photography.

#### *Family Photography*

In chapter 4 of his book *Snapshot Versions of Life* (Chalfen 1987), Chalfen discusses patterns in family picture-taking by outlining picture-taking throughout a hypothetical man’s life. This life and its photographic representation starts at birth, one of the few times pictures are taken in a hospital, and often an excuse for a family to invest in a camera. Photography continues through various positive milestones of infancy and

childhood (“firsts,” “high-priority moments,” gatherings of people, holidays, and the occasional photo that violates norms for humorous or “it’s not so bad” intent), with the frequency of photos decreasing as the child ages. As the child enters adulthood, he will take and appear in photos of travel and his wedding but not often otherwise until his first child, when the cycle starts again. He will also take pictures of new material wealth, “their leisure and its symbols,” and of reunions and other celebrations of the past, but never of work or the workplace.

Chalfen notes that adults don’t like being photographed, especially as they age. Sickness, death, and other negative events are also usually not photographed, with the exception of not really *seriously* negative events (the “it’s not so bad” pictures referred to in the last paragraph). Some photos may be intentionally eliminated from a collection, as in the case of divorce. In this way, the gaps in a family’s photographic record can be just as telling as what is shown. Overall, “more is left out than included”; a typical family photo collection “represents thirty seconds of accumulated life,” showing just “outwardly visible evidence of socially accepted and positive change.”

#### *Tourist Photography*

Chalfen discusses the behind-camera and on-camera actions of tourist photographers and subjects, as they relate to social and cultural mismatches in photo habits, in Chapter 5 of *Snapshot Versions of Life* (Chalfen 1987). Chalfen notes that tourists want to capture different and authentic, yet family-friendly, pictures of native life. The usual conventions about what subject matter is off-limits shift because of the novelty of the tourists’ surroundings, and sometimes tourists cross the boundaries of what is locally acceptable to photograph, leading to social or institutional restrictions. One scheme that satisfies both the tourist’s desire for “otherness” and the locals’ desire for

privacy is offering staged (and family-friendly) presentations of “native life” (whether authentic or stereotyped), which have become common at many popular tourist destinations.

*Photography as Cultural Symbolism*

In “Redundant Imagery” (Chalfen 1981, 4:106-113), one of his earliest publications on family photography, Chalfen discusses how photos allow us to “symbolically structure a carefully contrived view of everyday life,” according to cultural norms. “From them we learn what is worth looking for and looking at.” They provide idealized memories of “appropriate” events. The style of family snaps is remarkably consistent and they “maintain a particular status quo,” “repeatedly telling the same ‘stories’ according to some master scenario.” Despite this sameness, photos have personal meaning and interest because of their context.

*Photography as “Evidence”*

In “Snapshots ‘R’ Us” (Chalfen 2004, 17:141-149), Chalfen outlines and discusses the implications of various uses of home mode photography as evidence, from evidence of “how we/they looked” to evidence in court or co-opted by the media. He also discusses how people treat photographs as “truth,” yet falsify them in various ways – a practice increasing with the conversion to digital media.

Others have discussed the role of photographs as evidence and assumptions about the realism of photography, including Jo Ann Oravec and Susan Sontag (Sontag 1977), who I will discuss below. Jo Ann Oravec (Oravec 1995, 29:431-446) notes that photography and video in courtrooms, conference rooms, families, and therapy used to be considered as evidence of how things actually were, but this assumption is being questioned more and more with the advent of easy digital manipulations. As it is

increasingly easy to retouch digital images and reconstruct video, the narratives that accompany these media will play stronger roles. Oravec also notes that video, film, and photographic accounts can play substantial roles in construction of self and groups, from small families to large corporations. Family albums in particular are widely seen as “keys to our past and to our senses of self,” and creating images and videos “are forms of personal expression tightly coupled with the self.” In summary, Oravec states that portraits and other pictures have become “widely construed by historians, psychologists, and artists as a critical factor in development of individual self-awareness. ... However, as understanding of how easily these portraits can be manipulated increases, the influence of the portraits in development of self-awareness is likely to be altered.”

#### *Photography and Narrative*

More recently, Chalfen challenged Barbara Harrison’s (Harrison 2002, 12:87-111) definitions of the “narrative” aspects of photographs with a pilot study of photo-sharing incidents observed with three families (Chalfen 2002, 12:397-404). He states that “just as cameras do not take pictures ... pictures don’t ‘say’ anything;” likewise, the notion that pictures “trigger” stories is misleading. In his study, he finds that most picture-talk is *identification* (“markers” that tell some portion of who, what, where, when), followed by *anecdote* (“identification and an allusion to an incomplete situation”) with *stories* (an anecdote with resolution) “coming in a distant third.” He also noticed some instances of “counter-narrative” (corrections to a story), which Harrison didn’t discuss.

#### *Photography and Video*

In “Family Photograph Appreciation” (Chalfen 2005), Chalfen discusses family photography and video recording practices with 30 Bostonian teenagers. He finds that

while the youth recognized that videos are a more “complete” record of an event – a sense of “being there” – almost all preferred photographs: they felt that photos provided a “trigger” for memories while video provided too much, that photos allowed for expansion and comparison beyond the pictured event, and that photos allowed for active participation, storytelling, and interactivity, which video did not. He concludes that in this context, “memory is much more often a reconstruction than a duplication ... more a work-in-progress than a Xerox copy.” Finally, though he doesn’t explicitly call attention to this, several of his quoted transcripts hint at a convenience factor for photos over videos, something that could change with digital media. These results corroborate our own; we have decided not to focus on video because it is a very different medium and is not used as often as pictures are (though this has changed for some people with the advent of digital cameras that can take short videos).

#### Christopher Musello

Christopher Musello (Musello 1980, 6:23-42) provides one of the more accessible summaries of family photography. He conducted his research on the social uses of family photography in 1980, a few years after Chalfen began investigating photography, and he borrowed from Chalfen for his own analysis. Musello interviewed and observed twelve American families to explore their “home mode” photographic habits, organizing his results into an extended version of Chalfen’s photographic framework of the photographic process. Musello split these habits into five events: planning, behind- and on-camera shooting, processing (an addition to Chalfen), editing, and exhibition; and five communicational components: participants, settings, topics, message form (defined as

family photography), and code. Along with Chalfen, Musello provides us a sense of “where photography was,” a point of comparison for our own research.

### *Planning*

Musello found that his families generally didn't plan pictures; they had cameras on hand but used them only at special events. Most families said they had cameras readily available but used film slowly. People generally carried a camera only when they had a purpose (e.g. Christmas, birthdays, Easter, vacations, and family gatherings). Planning picture content was rare except for “traditional” pictures (specific repeated pictures and shots of traditional events), though a “generalized, discriminating sensibility” could develop over time (e.g. reducing redundancy, including reference slides).

### *Shooting*

“Shooting” events included all of the actions of the photograph taker (“behind-camera shooting” actions) and the photograph subject(s) (“on-camera shooting” actions) at the time of taking the photograph and immediately before. Later I will discuss the important changes we have seen in shooting actions with the advent of digital cameras and cameraphones.

Behind-camera shooting actions aimed “simply to ‘record’” the moment; families valued candid shots but mostly took posed pictures for the control it allowed (especially as families aged), and they took a lot. Despite a range of skills, most “set out simply to ‘record’ what was before their cameras.” All said they liked to simply shoot “a lot” to make up for lack of thought about format, though some paid attention to centering etc. People valued candid shots when they were “appropriate,” especially with close friends/family (mostly governed by luck, sometimes simulated), but mostly took posed ones since it offered more control. Sometimes shooting was structured “by explicit or

implicit attempts to construct narratives.” Young parents (and first-time grandparents) take lots of pictures (and many more spontaneous ones) for the first 3-6 years of parenthood.

Subjects participated in picture-taking through “on-camera shooting” actions by posing, mugging, or avoiding the lens, often in age- and sex-stereotyped ways. On-camera shooting included “all those activities or behaviors which structure the subjects on-camera, including their own efforts to ‘present’ themselves.” The “ultimate evaluation of a photograph will lie in the image’s success as a likeness.” Behaviors depended on age and sex: young kids were easiest to shoot; boys were harder to pose; kids over 12 were the hardest subjects. Adults don’t like their pictures taken; they want to “control their presentation” or restrict picture-taking completely. “Many individuals frequently pose themselves without direction when a picture is to be taken, even if a candid shot is sought by the photographer.” Poses are sometimes stereotyped (e.g. “macho,” “glamorous”); some “mug” for candid shots. Musello flagged these issues as particularly interesting and worthy of further investigation.

#### *Processing and Editing*

Most families considered processing beyond their control, and couldn’t tell if bad pictures were because of their picture-taking or the processing. Though many of Musello’s participants developed their own photos at one point (particularly as an “artistic” hobby before having children), none continued doing it after they started families, and none used it to develop their personal (non-artistic) “snapshot” photographs.

All families thought editing (including culling, sorting, and sometimes adding narratives and other memorabilia) was important, but “their efforts were generally far below their expectations.” Young couples were the best about keeping up. Junk images



may be thrown away right after developing; then pictures are moved to the ‘shoebox’ (or slide carousel). When sorted (usually chronologically) and put into albums, photographs may be excluded if “they are repetitive, strongly out of focus, or improperly exposed,” but only rarely will content be a reason for exclusion. Families may include narratives and memorabilia in the albums.

While many photos went into albums, only a few that were “exceptional in content” were placed on walls and were rarely changed or noticed. (Rose, in contrast, found that mothers in particular often notice and reflect on these photographs (Rose 2003, 28:5-18).) All participants had criteria for what photographs were appropriate in public or private spaces, though these criteria were highly variable and personal.

#### *Exhibition*

Only a portion of pictures were readily available for exhibition (usually with family), the “culmination” of photo-taking. Each photograph fell along a “continuum going from exhibition (walls, albums) to non-exhibition” (attics, backs of closets, and other inaccessible places). Viewing was seen as a family event, and ranged from formal slideshows to informal events triggered by new pictures or searching out a particular photo. Patterns of response – for example, ritualized stories or interpretations – developed around repeated viewing of some pictures. Collections tended to move from greater to lesser accessibility, over time, and viewing becomes rarer and more selective as they do. As organization activities decline, picture-viewing decreases in importance.

#### *Communicational Components of “Home-Mode” Photography*

Musello found that both parents participated in picture-taking (though Slater claims that fathers do more [Slater 1991:49-59], and Rose notes that mothers do almost all of the editing and distribution [Rose 2003, 28:5-18]). Common picture subjects

included immediate family and sometimes close friends and other relatives. Participants reported that interactions between the photo-taker and subject is more idiosyncratic (though often still patterned) as the candidness of the picture increases.

Musello noticed that many home-mode photographs are “context-free,” focusing on the people instead of the scenery except when the scenery was somehow exceptional. Photos were usually taken in public areas, rarely in bathrooms or bedrooms, and often featured “ritual locations” such as a nice curtain or flower-bed as a backdrop. Topics – holidays, events, and vacations – were consistent across families, generally aimed to provide an ideal presentation (with the exception of the few “embarrassing” but ultimately harmless photos that Chalfen also noted), and never included pain, death, anger, work, or banal activities.

Overall, Musello, like Chalfen, found that the “code” of home-mode photography, or the “distinctive organization of formal and syntactic elements,” is surprisingly regular across family photograph collections. Coding images can be problematic because of the range of competencies among family photographers, and because professionals may emulate the “feel” of family photos. Given this, what should count as a “family photograph?” And how can highly-situated meaning be extracted from a photograph alone? For this reason, while family pictures do exhibit a somewhat unified cultural code, this can only be determined from context, not from content alone.

In our own research we tried to do some coding of images and ran into the same problems. At most, we could categorize the content of the images, but even that was difficult when we didn’t know what the photographer was actually meaning to capture and what was supposed to be the background.

Gillian Rose

Gillian Rose conducted two studies on family photography in the UK in the early 21<sup>st</sup> century, providing new insights and greatly enriching certain aspects of Chalfen's and Musello's analyses (Rose 2003, 28:5-18; Rose 2004, 5:549-564). As a "social geographer," Rose provides a unique perspective on family photography.

Rose interviewed 14 white, married, and "comfortably middle class" mothers with young children in southeast England. Interviews took place in the mothers' homes, lasted about 1 1/2 hours, and were recorded, transcribed, and analyzed using Tonkiss' discourse analysis. Though digital photography has been growing in use throughout the time of her research, the participants she recruited used only film. One reason for this could be that families are not usually the early adopters of new technologies, and they may rely more on the physicality of printed pictures (something we heard in some of our own interviews). Another reason surely is that some of her participants were recruited at a film processing center. She used the data from these interviews in both of the studies described below.

#### *Family Photographs and Domestic Spacings*

In "Family Photographs and Domestic Spacings" (Rose 2003, 28:5-18), Rose argues that photographs are used in defining a domestic space that includes distant spaces and times. This use is both "integrative" of distant spaces and times and "haunted by fractures and absences" (especially by what the photographs themselves evoke), but not in a traumatic way. She explores two dimensions of the "differential spacing of family photography": "here-now/there-then" and "presence/absence." Rose also comments on Ronald Barthes' "studium/punctum" (code/emotional content) division of photographic meaning presented in *Camera Lucida* (Barthes 1982).

Rose explains that domestic spatiality is “stretched beyond the walls of the home” by the centrality of both presence and absence to family photography. The “referentiality” of a photo means that it is treated “as a trace of the person it pictures,” and can thus bring their presence into the home. But that presence is most valued when “the actual person is in fact absent, or changed.” The temporal aspect of this stretching is complex, “supplementing the here and now of the photograph’s presence with a there and then” in the past, both progressive (a “log”) and episodic (as events or milestones), and in the future.

Families are understood both as ‘together’ through this domestic space and as inherently ‘apart’. Yet none of this is “disturbing.” While mothers were at times struck by particular photos, a “shock” (Barthes’ *punctum*) they had trouble articulating, the shock was not more than “regret at absence and change” or “part of a mother’s relationship to her child.”

Family photography became popular in a period of mass migration, and family photos have always been “a portable kit of images that bears witness to [a family’s] connectedness.” Though both mothers and fathers take pictures, only mothers edit and distribute them. Mothers saw managing photography as part of being “a proper mother.” Distributing photos “enacted familial integration,” but uneven distribution (e.g. fewer or no photographs sent to a disfavored family member) reflected “less than ideal familial orderings.”

Mothers looked at photographs often, both when they work on albums and when they are working around the house (in contrast to Musello’s findings about how wall photographs blend into the background and are rarely noticed [Musello 1980, 6:23-42]).

These mothers were aware that their photos – generally showing families happy and at leisure – exhibited a “cultural predictability” that some researchers use to dismiss family photos as “trite and banal.”

The “referentiality” of participants’ photos came up in several ways in Rose’s interviews. First, photos were seen as an accurate “imprint” of a scene. They provided “evidence of what people looked like,” and were seen as “offering a different and more accurate view” than the view one has when “in the thick of it” (which is especially important for mothers of young children, who are so busy getting through each day that “their longer term memories are diminished”). Finally, photographs were “addressed or described as if it was the person it showed.” For example, some mothers were embarrassed about pictures in the bedroom as if those pictured could look out on private activities.

Rose noticed that this presence that photographs evoke is supplemented by a sense of absence or emptiness. Photographs are taken, looked at and circulated “in relation to a spatial absence,” and the more distant family members are, the more important photographing to demonstrate togetherness becomes for a family, to “bring near those far away.”

Rose’s participants always placed framed family photos in groups, defining family membership, the frequency of happy family times, and spatial dispersion. These groups could be easily rearranged to allow for growth (and for family instabilities such as divorce, though that isn’t actually planned for in groupings). These groupings reiterate the pervasive themes of closeness/distance and presence/absence.

There are also absences made by time as people age and ultimately die. Rose finds that “much of the pleasure of photos seems to be in this there-then dimension; as Jane M said, ‘it’s a very nice thing to look back’.” A photograph is especially important because it can bring back memories. Particularly significant were memories of children’s “development” (as a record of milestones, a “log,” and to compare to “average” development). Mothers see their own lives as episodic, divided into the time before children and the time after. Time is extended into the future as mothers anticipate giving photos and albums to children.

*‘Everyone’s cuddled up and it just looks really nice’*

In another analysis (Rose 2004, 5:549-564), Rose explores the ambivalence mothers feel toward their photos, “at once intensely charged and embarrassingly trivial,” which can be embodied in the concept of “togetherness.” Mothers were aware that their photos were the same as those in many other family collections (an awareness of cultural codes, or Barthes’ *studium*): because of this, photographs were not always treated as precious objects, and the practice of taking photographs was also trivialized. However, their meanings were at the same time intense and personal. Knowing the people pictured was vital to the togetherness generated by viewing family photos. Photos rarely showed family members alone, and the spatial proximity of people in the images symbolized and reiterated “the integration of the family unit.” The photos themselves were grouped to reiterate family togetherness. Finally, viewing itself was often a family affair, and young children especially loved looking at photos (which were used to teach them who was in the family).

Rose found that all mothers felt “compelled” to photograph their children, especially when those children were very young, and felt that sorting and displaying pictures was part of their duties as a mother.

As their babies grew, all those mums agreed with Tina when she said, ‘you just have to make a conscious effort to keep snapping away I think’. ... Photos were on display everywhere in their houses, even in the toilets. ... [All mothers] made time to date, sort, store, display and circulate their photographs.

Together with the photos themselves, as “if [the photos] were part of the people pictured” (integral to Barthes’ *punctum*, the personal emotional charge of photos). In this way, “throwing away a photograph would be like throwing away (part of) the child.” Mothers found this *punctum* very difficult to articulate. One part of it has to do with the difficulty of the relationship between mother and child when the child is very young (the time when most photos are taken) and completely dependent and selfish, which gives rise to feelings of ambivalence (both love and “hate”) in the mother. Photos mitigate the “hate” by evoking togetherness, but with a miniaturized, mute, and controllable version of the child.

#### Other Cultural Historians and Critical Theorists

##### *Jo Spence*

Like Gillian Rose, Jo Spence, in her introduction to *Family Snaps* (1991), notes that family photographs help recreate a sense of family as real families are increasingly fragmented. Photos are interpreted emotionally as well as practically, though interpretations that “subvert collective meanings” (especially positive, socially-appropriate meanings) are discouraged.

Recording an event has become part of that event – and perhaps the most important part; for, however untidy or unsatisfactory the experience, we can ensure that the picture will project the appropriate [positive] emotions into the future.

This projection helps viewers experience a “longed-for ideal” when the pictures match up to expectations. Nonconformity, violence, family “fluidity,” and other deviations from the ideal are suppressed. Since image developing and manipulation is often taken for granted, the veracity of image content is too. While fathers take the pictures, mothers are the “historians” (the latter point is consistent with Rose’s findings [Rose 2003, 28:5-18], though the former contradicts Musello [Musello 1980, 6:23-42]). Travel photos are idealized, recreating a “vision of a nostalgic national and regional past.”

Later in the book (Seabrook 1991:171-185), Jeremy Seabrook discusses the role of photographs in aging and death. Some use photographs as a substitute for dead loved ones; others fear the fate of their precious collections after they pass away. People sometimes try to create idealizations of even fabrications of their past for posterity.

*Don Slater*

In the same volume (Slater 1991:49-59), Don Slater summarizes the history of the Kodak camera and posits that Kodak marketing and design played a large part in redefining photography as part of the consumptive domestic sphere, particularly equating the ease of snapshotting with “women’s work.” In another book, Slater expands on these ideas, showing the ways in which domestic photography ties together the public sphere (through social norms), the private sphere (through family), consumer culture, and leisure, and helps us form identities (Slater 1995:129-146). The “privatisation of leisure” indicates the move toward “home-centered” consumerism and leisure, even between individuals within a family. Slater notes that domestic photography has resisted changes brought about by digitization. For example, we still “construct ourselves *for* the image



and *through* images,” actively taking on various norms for the camera and then re-living these “idealised moments” through the photographs to remember and to create identities.

This self-representation, often through family albums, is felt to be very important yet is rarely viewed (“at most ... a kind of one-off reliving of a recent leisure experience”). An alternate metaphor is that of the “pin-board”: an ongoing and continually shifting self-presentation that is in the present instead of in the past, and that is focused on communication more than “commemoration.” Slater hypothesizes that this alternate use of images will be marginalized until it is integrated into structured leisure time. Interestingly, in our own findings of online sharing/exhibition and in Cohen’s work on photobloggers (Cohen 2005, 27:883-901), we see more of this ongoing self-*presentation* that Slater described, though many people still focus heavily on, and seem to privilege, the more traditional practice of retrospective self-*representation* in photo albums.

Slater also muses on the potential of domestic photography to empower users, “demystify” and critique dominant representations, and engage in “cultural politics,” but notes that it is not currently being used in this way.

### *Susan Sontag*

Around the same time Chalfen wrote *Snapshot Versions of Life*, Susan Sontag compiled her classic book *On Photography* (Sontag 1977) from a set of essays on the social implications of photography. Though she talks extensively about professional photography as well, her many insights on amateur photography have informed, inspired, and guided our work. Because her work is so rich and difficult to summarize, I have referenced her in the places where her thinking has affected ours and I will decline to provide a summary here.

*Photography in Human-Computer Interaction Research*

Almost none of the researchers mentioned above have discussed new innovations in photography. Don Slater is the one exception, though his prognosis of digital photography is critical (Slater 1995:129-146). Researchers in human-computer interaction have been much more interested in embracing new technologies and exploring further opportunities to innovate. Two groups have started to explore cameraphones in particular. Several more have investigated digital photography usage; I will summarize the three we have found most useful. Many others have built tools for photo-organization or sharing and have conducted user studies on these tools. I will summarize a small selection of these as a window on the “state-of-the-art” and the kind of thinking that many human-computer interaction researchers apply to the “problem” of photography. Overall, we take from these studies a sense of what has been happening more recently in personal photography and how innovations have been affecting photographic habits. Most of these studies are fairly small and short-lived, and they do not generally try to dig deeper into the behaviors they notice to find out more about *why* their study participants exhibit those behaviors. In our research, we have tried to make up for both of these shortcomings by doing longitudinal research on a large group of subjects, exploring higher-level photographic activities and how various photographic technologies support them.

## Cameraphone research in HCI

Mäkelä et al. (Mäkelä et al. 2000:548-555) conducted a four-week field study in 1999 with four 12-year-old boys in Helsinki and four children, their parents, and their grandmother in Vienna. They used digital cameras and backpack-bound laptops as a

“medium-fidelity” prototype for real-time communicative imaging devices (the functionality now associated with cameraphones). They interviewed participants weekly throughout the study, both individually and in groups. They found that older kids shared “social” images with their peers (such as jokes, multi-image fictional stories, and other “everyday items”) using a shared “picture language.” Kids sent pictures to their parents as well, which the kids liked because they could hide that they were messaging their parents and could control what information they gave, and the parents liked though they were usually too busy to reciprocate. The grandmother invested a lot of time taking, editing, and sharing images with her family. Not many functional images were taken because participants reported that “images are too ambiguous, and the effort of production and translation too big.” Overall, during the study the meaning of images shifted from memory devices to in-the-moment communication aids, especially for “expressing emotions, moods and humor” and “self-made art” through storytelling, “expressing spirituality,” “expressing affection,” “increasing or maintaining group cohesion,” and “supporting conversation.” Though preliminary, these early “cameraphone” findings echo many of our own, as well as those of Mizuko Ito and Daisube Okabe, Ilpo Koskinen, Kindberg et al., and others who have done cameraphone research in various locations in the years since.

More recently, Kindberg et al. (Kindberg et al. 2004, HPL-2004-216) gave free picture-sending capability to 19 UK and 15 US youth and adult cameraphone owners over two to five weeks (when they took at least ten more images) in 2004, and interviewed them both at the beginning and at the end of the study. They found that participants captured an average of eight images a week and mostly shared them in

person, off the phone handset. Only 23 participants sent photos during the study. Half of the images taken featured people, and one third featured a specific object.

Kindberg et al. found that their participants gave reasons for capture that ranged from “functional” to “affective” and from “social” to “individual,” with about one quarter of the images having two or more intended uses. Most pictures were “affective:” for personal reflection (41%), for mutual experience (35%, 59% of which were taken for “enhancing the moment”), or for sending to absent friends or family (21%, 27% of which were sent “in the moment” as “a compelling way to stay close” and most of the rest used for storytelling later). Others were intended for functional reasons (4% for mutual tasks; 8% for remote tasks, half of which were sent; and 10% for personal tasks). Some images across multiple categories were used as “proof or evidence of something.” Sent images often utilized a “shared context of understanding.” Images taken for one reason were often used later for another, including in-person sharing from the phone, sending, and archiving.

Kindberg et al. found that generally, youth took more “mutual experience” images, shared more face-to-face, and archived less than adults. UK participants shared and sent more images. Men took more personal functional images than women. All participants liked that cameraphones were always on hand, and many photos were captured in atypical situations (e.g. work/school, casual social settings). However, many wanted easier sending, better quality (including low light), easier printing, and automatic metadata capture. Overall, there was little “capture and send” but a lot of “capture and show.” The authors recommend that cameraphones facilitate showing and giving in the

moment, multimedia communication, personalization, recording context, archiving, and (short-term) task management.

Both Mäkelä et al. and Kindberg et al. provide valuable insight into cameraphone behaviors, and many of their findings are echoed in our own. As the uses of cameraphones stabilize (and they stabilize differently in different cultures and subcultures), it is important to continue to research the ways in which cameraphones are being used. Our study provides an in-depth follow-up and clarification of these studies.

#### Explorations of Digital Photograph Use and Sharing in HCI

Several research groups in human-computer interaction have done detailed analyses of digital photography practices. Frohlich et al. interviewed and conducted three-month diary studies with eleven northern California families who used digital pictures in 1998 (Frohlich et al. 2002:166-175). They found that both physical and digital “photoware” falls into four categories differentiated by time and place: co-present sharing, archiving, remote sharing, and sending. They discovered that digital had not replaced film photography, but was used “as a vehicle for duplicating and distributing those memories.” Since “photographs are taken ostensibly to capture memories for future personal reference, but in practice are used to review and communicate experiences with others,” successful photoware had “the greatest affordances for image-based communication.” They suggest the development of photo conferencing, multi-user albums/joint accounts, instant photo sending/sharing, easily created “mini-albums,” easy labeling such as “audio-annotation” (including the recording of storytelling conversations), and augmented prints.

*Archiving*

Frohlich et al. found that archiving practices varied widely between families. For prints, albums (or alternatives such as collages or themed scrapbooks) were “seen as the best way of archiving,” but everyone fell behind with it. Some tried to solve this problem with temporary albums, while others just left pictures in their envelopes. Participants complained most about “forgetting details of people and events depicted in old photos.” Archiving could be for “posterity” or for “particular social purposes or events.” Nobody organized their digital pictures aside from uploading them into a new directory, though all hoped for better options in the future.

*Sending*

Sending practices were similar for all families: all ordered duplicates to give away and sent digital images (preferably as email attachments since they were “embedded”; websites were seen as a “workaround” for large collections). They enjoyed getting feedback on the photos as much as sending them. A few published “unusual” photos on the web for a wider audience.

*Sharing*

Participants reported that sharing photos in person was “the most common and enjoyable” form of sharing. Some participants discussed photos over the phone as a “remote sharing” substitute. Most said they were “turned off” by the idea of viewing digital photos on a computer. Sharing techniques were determined by whether the participants all shared the memory pictured. Storytelling (or collaborative storytelling) took place when some participants did not share the memory (40% of the sharing occasions), which consisted of an asymmetrical (but still active participation) communication of “status, experience and wisdom.” In contrast, “*reminiscing* talk” took

place when all participants shared the memory (60% of the sharing occasions), which often consisted of symmetrical conversation focused on “jointing ‘finding’ the memory together” but not elaborating it. Finally, not all stories told around photographs related to the photographs at hand.

	Same time	Different time
Same place	<b>Co-Present Sharing</b> (prints, slides & projector, photo-viewing software & devices)	<b>Archiving</b> (shoeboxes, albums & frames, CD-Rom, hard disk, photo website)
Different place	<b>Remote Sharing</b> (telephone, application sharing, IM, video conferencing)	<b>Sending</b> (mail, email attachment or website reference, internet photo frames)

**Table 1.** Frohlich’s four quadrants of digital image usage, organized along two axes (same time to different time, same place to different place).

While Frohlich et al. provide one of the more detailed summaries of existing digital photograph practices, a few other studies have also investigated digital camera and image use. Some of these validated Frohlich et al.’s findings, while others documented practices that were not covered by or seem to conflict with Frohlich et al. Some of these differences may be due to the fact that Frohlich et al. conducted their study when digital cameras were still relatively rare and their use hadn’t begun to stabilize yet (Bijker, Hughes, and Pinch 1987).

Rodden and Wood provided digital cameras and the “Shoebox” organization tool to 13 AT&T Cambridge Research Lab employees for six months in 2000. They found that participants took more pictures with their digital camera, including some “everyday” and some short-term functional pictures, and many replaced their film cameras with the digital cameras entirely (in contrast to Frohlich et al.’s finding that digital cameras at most supplemented film). They made prints of favorite pictures, but liked not having

prints for everything. Participants could search for images in three ways: by event (the most frequent, decreasing as the event is longer ago), by individual photo, or by theme (such as a person's presence; this is rarest). Chronological and event-based organization helps the first two search tasks. The last one would be helped by annotation, but participants felt that the cost of consistently annotating an entire collection is not worth the occasional searches. No participants found advanced features such as visual search or automatic transcription useful, possibly because of the limitations of existing technological methods for doing these tasks.

Crabtree et al. (Crabtree, Rodden, and Mariani 2004:396-405) take a different approach to exploring digital photo sharing by relating two “vignettes” from their ethnographic study of face-to-face photo-sharing to make design recommendations for distributed collaboration around digital photographs. They found that “photo-talk” has both “group views” and “personal views,” that distribution of photos is regulated by a “control center” (usually the picture owner), that photo-talk is “recipient-defined” (varying with the audience), and that many gestures (pointing to parts of a picture, demonstrations, etc.) are used in face-to-face sharing. They suggest that these features should be integrated into digital photo-sharing tools for more effective remote collaboration around digital images.

#### Tools for Sharing and Organization

Hundreds of tools exist to assist in organizing, archiving, sharing, or otherwise manipulating digital images. While I do want to be reasonably familiar with the state-of-the-art, keeping up with all of the myriad and sundry innovations is an impossible task. Presented here is a selection of photo-organization and sharing tools that have been



presented at human-computer interaction conferences and are often cited in HCI literature about photos. While they are not as relevant to our study as other work that investigates real-world practices, some of their experimental features have been adopted by mainstream sharing software so I will include brief descriptions of them. The first two interfaces address sharing digital pictures in particular, since this has been identified as a “problem” in the HCI field. The remaining systems address the organization and archiving of pictures.

Balabanovic et al. (Balabanovic, Chu, and Wolff 2000:564-571) created a hand-held tool for constructing narratives and sharing digital photos. Audio can be recorded over a photo “track” to create a multimedia narrative. These images and audio files can be sent to distant others or shared in person. Six pairs of participants used the tool for face-to-face sharing, and two participants used the tool for remote sharing. Balabanovic et al. observed both “photo-driven” and “story-driven” sharing. Participants reported three main organizational styles for existing photographs: the “shoebox,” the album, and the website.

The PhotoStory tool (Vronay, Farnham, and Davis 2001), another tool designed specifically for photo-sharing, allows users to easily create “cinematic” photo-storytelling movies by recording narration and monitoring mouse movement to automate panning and zooming. An exploratory survey of 84 people found that participants had a slight preference for voice with panning/zooming pictures over text with still pictures or any other combination. Eight participants in a subsequent user study enjoyed making a story out of their images using PhotoStory. Vronay et al. did not test other aspects of the PhotoStory experience (e.g. sending, receiving, responding).

Other innovations that were designed for sorting or archiving digital images have been adopted by many online sharing sites, such as thumbnail views, “focus+context” interaction, representative pictures for groups of images, automatic organization by date, and annotation features. Bederson’s PhotoMesa (Bederson 2001:71-80) interface provides a unique photo visualization using quantum treemap organization and “focus+context” interaction. PhotoTOC (Platt, Czerwinski, and Field 2002) uses representative thumbnails for groups of pictures to provide an overview of pictures and organize them by date. Fotofile (Kuchinsky et al. 1999:496-503) incorporates narrative-making, as well as bulk annotation, a hyperbolic tree view, and some automatic feature extraction, into a digital album-making system, but for the purposes of archiving rather than sharing. MediaBrowser (Drucker et al. 2004) integrates many photo-organization innovations, including quantum treemap organization, “focus+context” interaction, representative thumbnails for groups of pictures, and annotation. MediaBrowser also provides many views, including a time-based view, and many interaction mechanisms, including a two-level fisheye and easy selection by group or keywords.

### *Crossing the Boundaries*

A few research groups studying photography have bridged the divide between technologically-savvy human-computer interaction research and socially-rich social science research. Mizuko Ito and Daisube Okabe, who have researched mobile phone and cameraphone use in the Tokyo-Kanto area of Japan, is one research team. Ilpo Koskinen, a Finnish sociologist investigating cameraphone communication in Finland, and his cohort is a second. Kris Cohen, who has written a critical analysis of photoblogging, is a

third. We hope to be a fourth exploring this area. I will describe the studies these three researchers have conducted below.

#### Cameraphone Use in Japan

Ito finds that Japanese mobile media use is “personal” (in that everyone has their own mobile that they personalize), “portable” (in that mobiles enable “lightweight partial attention” or ambient social awareness), and “pedestrian” (in that pictures and communications are mundane) (Ito 2005b). The heavily-regulated social spaces in Japan help explain the popularity of discreet texting, along with Japan’s high literacy rate, habitual text/picture communication, and portable technophilia.

In diary studies and interviews with 15 participants in Tokyo-Kanto, Japan, in August-September 2005, Okabe found various patterns of cameraphone use (Okabe 2004). Most pictures were for “visually archiving an individual’s everyday life,” including some “visual note-taking.” Some pictures were shared with a few “intimates” to maintain “ambient virtual copresence.” Some pictures that were funny, unusual, or otherwise “newsworthy” were shared with a wider audience. Most sharing was off the handset: since sending pictures was considered “intrusive” and “narcissistic,” in addition to costly and potentially complicated, only a few carefully considered ones were sent. Okabe found that cameraphone pictures were “short-lived and ephemeral,” were more associated with an “individual viewpoint” than other cameras, and were used for “personal identity construction.”

#### Cameraphone Communication in Finland

Koskinen (Koskinen 2004) studied cameraphone-enabled communication among seven groups of friends in Finland between 1999 and 2002. Koskinen notes that

cameraphones differ from other cameras because they are with us always; they can integrate images with text, audio, and sometimes video; and they allow recipients to respond immediately.

Images as such [from cameraphones] are indexical, capable of supporting many interpretations, and get their meaning only in *the* context in which they are taken, processed, and viewed. ...

Koskinen gave four groups of five people a Nokia 9110, a Casio digital camera with an infrared link, and free phone service and computer accounts for two to three months each. Participants were asked to forward MMS messages as email attachments. He followed up by giving three new groups, two with seven and one with eleven members, an MMS phone and free service for five weeks.

Koskinen's cameraphone users constructed their multimedia messages "as postcards, greeting cards, travel stories, family photos, and stories." Often, text focused the recipients' attention on the "'preferred' interpretation and proper next action." Senders must "motivate the message"; recipients must then decide how to respond. Senders sometimes included text that drew recipients' attention to a particular part of the image, "interest arousers," or "response-prompting actions" (e.g. "questions and riddles"). Recipients may respond as expected, request clarification/elaboration (e.g. a "prospective visual," or an image that calls for a visual response), or even request that banal messaging stop (e.g. teasing). Overall, Koskinen noted a lot of playful communication and reciprocation with cameraphone images among friends.

Our own findings of the communicational uses of cameraphones echo these results at times but are different in many respects. The possible reasons for this are many. First, the groups that we studied were not only friends, but peers, classmates, and coworkers. They interacted in a wide variety of situations. Second, our group was much

larger, and our study stretched over nearly a year. There may also be cultural reasons why Koskinen's results differed from ours.

#### Photoblogging in the UK

While Kris Cohen did not focus on cameraphone users in his study, his findings on photobloggers, and his general technique of analysis, can offer clues and insights about cameraphone use. Cohen interviewed 30 UK photobloggers about their photographic and blogging practices in 2004-2005. Overall, he found that photobloggers enjoy the way that photography and blogging reinforced one another – indeed, one of the main functions of the photoblog was to provide motivation for indulging in the pleasure of taking more pictures. Another was to capture special moments or moods in artistic ways, and to provide a “proliferation of occasions and sites for photography.”

... [T]he activities that occur at the moment of photography, in the way the doing of the photoblog conjures these activities, and the reciprocal way that the doing of photography conjures the photoblog. ... The photoblog collapses the *activity* of photoblogging with the *activity* of photography without collapsing (1) the *space* that separates the making of photography and the blogging of them, or (2) the *time* that separates these activities ... or (3) the desires and pleasures that energize both activities. Photography and blogging become interarticulated. They become mutually motivating. ... Photoblogs incorporate, and are in turn incorporated by ... (1) the self of the photoblogger, (2) a potential audience for the self's activities, (3) those activities themselves (taking photos) and (4) the technologies that operate in and around these entities. [emphasis original]

Cohen found that photobloggers tend to take (and enjoy taking) a lot of photographs, especially candid pictures of ‘the everyday,’ the ‘banal’ or the ‘mundane.’ They don’t like taking “conventional holiday or Big Occasion snaps,” using a flash, or poses (except ironic). Photobloggers like to experiment with photography, and feel that they can freely since digital pictures are free. They hate forgetting their cameras since photos capture a specific experience and often can’t be re-staged. They report wanting to be able to capture more pictures more easily, “collapsing” the barriers that separate

existence from the making of photographs. They generally upload a picture within a few days of taking it, selecting photos by “instinct” (though they don’t know if a photo will be “interesting” until they look at it later). They caption to tell their audience “what they had in mind when they took the photo” or what an ambiguous photo depicts. Interestingly, they find prints “annoying” since they’re more difficult to use – they can’t be as easily shown off to as wide an audience (even if the audience is imaginary), a result echoed by many of our younger and more technically-savvy participants.

### *Themes and Lessons*

Previous studies in human-computer interaction and the social sciences have found that film camera, digital camera, and now cameraphone use have several recurring themes: time, space, sociality, and functionality. Our study provides additional insights and complexity to these themes by drawing on a larger data set generated over a longer period of time in a different environment.

#### Time

The first theme that pervades the research on photography is *time*. Photography has always resisted the transience of life by “capturing the moment,” in the words of Sontag (Sontag 1977). Slater (Slater 1995:129-146) and Frohlich (Frohlich, Kuchinsky, Pering, Don, and Ariss 2002:166-175) both note uses of images that range from current or ongoing to archival or retrospective. More ephemeral uses of images have been documented by both Kindberg (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216), on cameraphones, and Cohen (Cohen 2005, 27:883-901), on photoblogs. Rose (Rose 2003, 28:5-18) and Seabrook (Seabrook 1991:171-185) discuss notions of time in photographs as tied to change and loss. Finally, the screens on digital cameras and

cameraphones compress time by allowing for instantaneous reflection, experimentation, and feedback.

### Sociality

Another theme that appears in many of the studies described above is *sociality*. Some images are intended for oneself, others for specific others or groups. Ito and Okabe (Okabe and Ito 2003), in a study of 15 cameraphone users in the Tokyo-Kanto area of Japan in 2003 (where cameraphone adoption preceded the US), found that the pictures the participants took with their cameraphones fell into three categories along a continuum of sociality: records of daily life for personal use and short-term recollection, photos sent to “intimates” to maintain virtual co-presence, and photos of personally newsworthy events shared with a larger friends group. Kindberg et al. (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216) also found both “social” and “individual” uses of cameraphone images in their 2004 study of 34 US and UK cameraphone owners. Koskinen’s study in Finland between 1999 and 2002 focused on social exchanges between friends, including riddles and games (Koskinen 2004).

### Sharing

A third theme, *sharing*, involves both time and sociality and also place. While *sociality* can be roughly pictured as a map of concentric rings, ranging from the picture-taker alone in the middle (for a picture meant only for the self) to the whole world as the largest outermost circle (for a picture meant for the general public) and all one’s various friends and family groups between,<sup>1</sup> sharing refers to a specific *act* of sociality, with a

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<sup>1</sup> Of course, friends groups are never really this simple; this description is merely meant to illustrate the difference between *sociality* and *sharing*.

specific picture (and its associated affordances – e.g. prints vs. digital), situated in a certain time and place.

Prints are often shared in person (same place and time), though their durability lets them persist across decades and generations, as Chalfen (Chalfen 1987), Rose (Rose 2004, 5:549-564), and Seabrook (Seabrook 1991:171-185) discussed. Several researchers (e.g. Balabanovic, Chu, and Wolff 2000:564-571; Crabtree, Rodden, and Mariani 2004:396-405; Vronay, Farnham, and Davis 2001) have specifically analyzed and designed for the spontaneous “phototalk” that occurs during face-to-face sharing, while others (e.g. Volda and Mynatt 2005:171-189) have augmented other communicative media, such as instant messaging, with imaging capabilities, and analyzed the outcomes.

Digital images can be more easily shared remotely or asynchronously, though many still share them face-to-face. Ito and Okabe (Ito 2005a; Okabe and Ito 2003) found that their participants sent many cameraphone images via email or MMS to a select few “intimates” (e.g. a spouse or best friend) but preferred sharing with other friends in person. Kindberg et al. (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216) further found that many images were shared with copresent others or with absent friends and family using a “shared context of understanding” and provided “a compelling way to stay close” or for “enhancing the moment.” Several researchers have found that many respondents preferred synchronous sharing, where they could tailor the presentation of the image to their audience and current conditions (e.g. Crabtree, Rodden, and Mariani 2004:396-405; Koskinen 2004; Volda and Mynatt 2005:171-189).



### Functionality

Finally, a fourth theme that has only been observed with cameraphones is *functionality*. Kindberg et al. observed both “functional” and “affective” uses of images (with the majority of the images in the “affective” category) (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216). We have also observed this, as described below.

### Themes in Method

Most previous studies of cameraphone use have followed small numbers of people over a short time, for reasons of either technology or methodology. However, cameraphones are embedded in on-going social practices of photography and communication. We have to ask what factors of culture, life stage, and life conditions interact with images, with their uses, and with cameraphones, and therefore to what extent we can make inferences from the populations that have been studied. These studies on cameraphones focus mostly on purely social uses. Our study has begun to explore longer-term usage of cameraphones in large populations who interact in work and learning settings; our study begins to explore this. In our study, we gave cameraphones and online image sharing and management capabilities to 70 people in a strongly-linked network who interacted in both work and social settings, and we were able to chart the development of their imaging and sharing practices over up to twelve months.

Interestingly, almost all of the investigations into the social uses of photography have used interviews, with the exception of a few diary studies followed by interviews (Ito 2005a; Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216; Koskinen 2004; Okabe and Ito 2003) and one ethnography (Crabtree, Rodden, and Mariani 2004:396-405). Chalfen, Musello, and Rose all used interviews in their studies (other

cultural theorists did not state how they collected their data). We also chose to use interviews, despite their limitations, as our primary data source for this investigation (supplementing it with participant observation and usage statistics). Unlike some other activities, photography is often highly integrated into daily life, and in many cases it only appears at occasional, sporadic moments. It would be very difficult to conduct an ethnography on photography in part for this reason, though we have made ongoing observations of people taking photographs<sup>2</sup>, and we do plan to conduct field studies of photo-sharing.

Diary studies (including “beeper” studies) are another attempt to bridge the gap between the experiencing of the event and later reflecting on it, but the process of completing the diary study, like the presence of a researcher, changes the experience. We have found it fruitful enough to go back through participants’ photographs with them, allowing our conversations to be open-ended rather than predetermined.

We, like many of the researchers investigating the social uses of photography, are interested in participants’ conceptions of the photographic process as much as, if not more than, the photographic process itself. Though one of the main complaints about interviews is that such after-the-fact self-reflection is often biased and incomplete, those mental constructions and omissions are also of interest in how people conceptualize photography in their lives. We have used several techniques to explore the differences between these conceptualizations and reality, which I will describe below.

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<sup>2</sup> We have done field observations at popular tourist sites on our picturesque campus and elsewhere in our area, as well as during our own vacations and special events, as discussed in more detail later.

### The Importance of Culture

Ito (Ito 2005a) cautions against generalizing from the highly situated studies that have been done. She describes how the Japanese mobile phone practices, such as mobile email during long commutes on crowded trains, specifically suit Japanese living conditions. Similarly, text messaging suits young people's lives across several cultures, where silent messaging allows continual connection to friends. She exhorts researchers to consider social, cultural, and historical specificities.

A recent New York Times magazine article echoes these precautions (Thompson 2006). Exposing the foibles of technological determinism, writer Clive Thompson notes that email, voicemail, and other asynchronous messaging – which many in the US use extensively – are shunned as “socially awkward” among businessmen in China:

Chinese businesspeople, for example, rarely rely on e-mail, because they find the idea of leaving messages to be socially awkward. They prefer live exchanges, which means they gravitate to mobile phones and short text messages instead. (They avoid voicemail for the same reason; during the weeks I traveled in China, whenever I called a Chinese executive whose phone was turned off, I would get a recording saying that the person was simply “unavailable,” and the phone would not accept messages.)

Many of us are surrounded by peers with similar cultural outlooks and technology designed specifically for our market. Thus, it is easy to assume that cultural issues don't really matter, and it's the technology that is driving any change that is taking place. To those that hold these beliefs, the innumerable anecdotes like those above seem jarring, anomalous. But they are the norm, not the exception. We cannot take the findings of Ito in Japan or Koskinen in Finland at face-value, importing them to United States culture with impunity. Only with careful analysis of many factors – not just culture, but age, socioeconomic status, gender, and more – can we determine what behaviors are widespread and which are culturally specific.

## Methods

Our primary method of data collection has been interviews and our primary mode of analysis is the “coding” of interview transcripts using grounded theory techniques to, in effect, let the data speak for itself. We have chosen to do open-ended coding rather than looking for specific effects or activities in the data to the potential exclusion of other important, but unanticipated, effects. However, it is impossible to conduct an analysis – or to collect data, or to do research generally – without some theoretical perspective (Dourish 2006:541-550), and we have chosen to be explicit in defining ours. We believe that doing so is the most honest and responsible thing to do and, rather than making our results “biased,” it makes our results stronger by recognizing the inherent “biases” that are already present.

We try to avoid the extremes of technological determinism and social determinism by employing concepts from both Activity Theory and the Social Construction of Technology in our analytical framework. Though very few people actually take on either extreme in their position, it is easy for elements of one or the other to slip into one’s reasoning. For instance, many technologists tend to assume some elements of technological determinism, especially when discussing cross-cultural technology adoption, as I described above. Many, from technologists to cultural theorists, take the techno-centric view that new photographic technologies will radically change photographic practices. Optimistic researchers (often technologists) celebrate the changes. Others pessimistically predict, with the advent of digital media, the “death of photography” and a “loss of the real” in this “post-photographic age” (Lister 1995:1-25). Some recognize the pitfalls of technological determinism but swing too far in the

opposite direction, assuming that technology is infinitely moldable to human needs and can fit seamlessly and invisibly into existing practices and power structures. While it is true that technology is a product of both the social process of design and the social process of use (and appropriation), it still holds certain characteristics that can in turn shape use in certain ways, facilitating certain kinds of use and discouraging others (Latour 1995:257-277; Lessig 2000:xii, 297 p.; Winner 1980, 109:121-136).

With Activity Theory (Engeström, Miettinen, and Punamaki-Gitai 1999), we direct our attention to the higher-level *activities* that drive photography use generally as well as the adoption of new technologies, rather than the low-level *actions* or *operations* that may change drastically in different situations even though they are supporting the same activity. Activity Theory also emphasizes community and the cultural effects on activities, actions, and operations. We are interested in the more stable, enduring activities or motives, which we are calling *social uses*, behind people's photographic practices and their adoption and appropriation of new technologies such as cameraphones. These *social uses*, as more fundamental and enduring than actions, can give us the best clues to what future use may be.

We use concepts from the Social Construction of Technology or "SCOT" (Bijker, Hughes, and Pinch 1987) to investigate the ways that new technologies are adopted and re-interpreted to suit existing needs, and in turn how new technologies can shift existing needs, be applied to unanticipated activities, or create other new opportunities. The key concept that we utilize from SCOT is *interpretive flexibility*: a given artifact (such as a cameraphone) may have multiple meanings (such as memory-capture devices, communicative devices, and expressive devices) for the same or different users. These

meanings are influenced but not determined by the design; they are created by users as they match the possibilities of the technology to their ongoing experience and activities. SCOT also talks about the *stabilization* of certain interpretations. We observed a partial stabilization of the cameraphone into three devices, which was only possible with a long-term study which overcame the “novelty effect” and allowed participants to integrate the cameraphone into their daily lives.

Overall, the goal of this study is to *explore* current use. While we are open to finding sites for technological improvement, we do not approach our study specifically looking for them or hoping to make specific design recommendations for future technologies. Some complain that social science research in general is “merely” descriptive in this way rather than being *proscriptive*. We see this as an asset rather than a shortcoming: it allows us to approach the subject with a more open mind, rather than assuming that we must find “problems” to fix and narrowing our focus to locating those to the detriment of our broader, richer understanding of the entire photographic ecology, both “good” and “bad,” functioning and not (Dourish 2006:541-550). That said, we are willing to make recommendations when they seem warranted and we do hope that designers find our investigations compelling and inspiring. Our search for higher-level “activities” using Activity Theory is one attempt to make our findings more enduring and to provide clues to future use. Technological design (and design of any kind) can almost always benefit from a better understanding of *in situ* technological use, and designers are in a much better position than we are to put these findings into action where action seems warranted.

To date, we have conducted 57 interviews and two focus groups. Our interview subjects, all of them “amateur” (as in not professional) photographers (though possessing a range of photographic skills), have included film photographers, photographers with digital cameras, cameraphone owners, and participants in a year-long exploratory investigation with cameraphones.

In this exploratory investigation, conducted during the 2004-2005 school year, we provided the incoming Masters 2006 class and various other students, faculty, and researchers in the Information School (a total of 70 people) with free cameraphones, free service, and the second generation of the Mobile Media Metadata software (MMM2) for annotation, archiving, and sharing. The details of this investigation are further described below.

### *Interviews*

We have conducted 57 interviews with 51 participants, as well as two focus groups with around a dozen participants each. We have interviewed seven participants twice and two participants three times; also, we interviewed two participants at once – partners, cohabitants, or family members in all cases – on five occasions. Interviews lasted one to two hours. One researcher conducted the interview, a second took notes, and a third (when available) operated a video camera and took still pictures. Participants signed a consent form at the beginning of the interview and a release form specifying what we were allowed to do with the data we collected at the end of the interview. Participants were not compensated financially for the interviews, but many said that they enjoyed process of thinking and talking about their pictures.

Though our interviews are always open-ended, allowing the participant to uncover what is most interesting to them and allowing us to customize our questions based on the circumstances of the interview and on what we have been learning in other interviews, the interviews have generally fallen into one of several groups depending on the situation in which we were interviewing them and the tools we were using during the interview.

1. **Film and digital camera interviews** (18 interviews):
  - a. *In participant's home* (13 interviews): includes a tour of the participant's photo collections around the house and a virtual "tour" of the participant's online images and images on their home computers, if any
  - b. *Not in participant's home* (1 interview, 4 short interviews): includes a virtual "tour" of the participant's online images and images on their laptops, if any
2. **Cameraphone interviews** (5 interviews): like film and digital camera interviews, but with many questions about cameraphone usage specifically and as contrasted with film and digital; includes a virtual "tour" of the participant's online images and images on their laptops, if any
3. **MMM2 interviews** (34 interviews):
  - a. *General usage interviews* (16 interviews): includes a "tour" of pictures in the participant's MMM2 account and other pictures online; lots of questions specifically about MMM2 behavior



- b. *Photo elicitation interviews* (9 interviews): includes a “tour” of pictures in the participant’s MMM2 account *using a photo elicitation tool developed for the interviews*, and a virtual tour of other pictures online; lots of questions specifically about MMM2 behavior (more description of photo elicitation below)
- c. *Follow-up interviews* (9 interviews): questions specifically about MMM2 behavior and the ways it changed picture-taking behavior since MMM2 or the graduate school experience generally

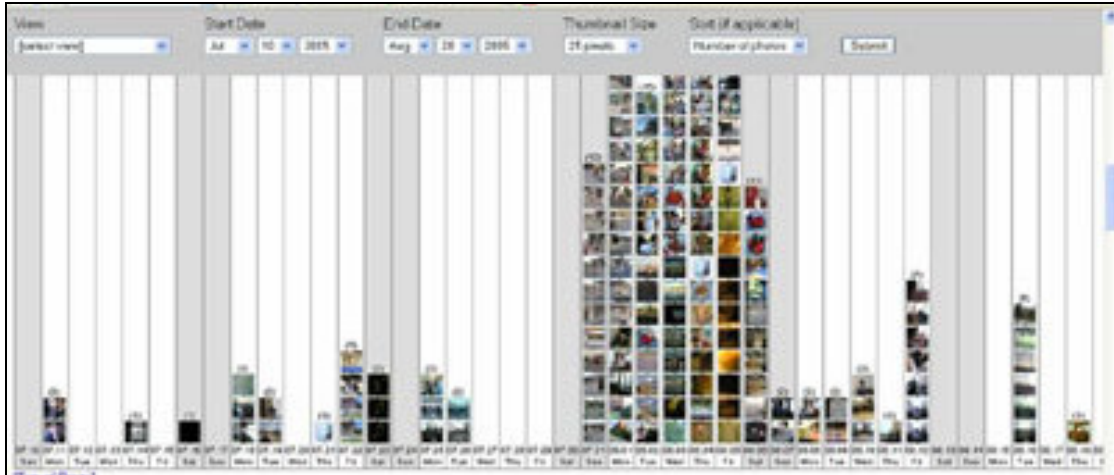
These different interview types, despite their different foci, did have a large degree of sameness. We make sure to cover the following basic categories with every participant, though the order in which we discuss these topics and the depth to which we take them depends on what the participant finds most important about their own photographic practices. In many cases, we never needed to explicitly bring up a particular topic, such as sharing or the differences between film and digital: participants brought it up on their own in response to our most general, high-level questions.

1. Photography experience (*family practices growing up, overview of various practices*)
2. Photo habits with different cameras owned (*what cameras owned, why*)
  - a. Taking pictures (*when, what, how often, how many, features used*)
  - b. General actions with pictures (*what they do, want to do, etc.*)
  - c. Storing, annotating, backing up (*which are kept, where, how, thoughts on/precautions against loss*)

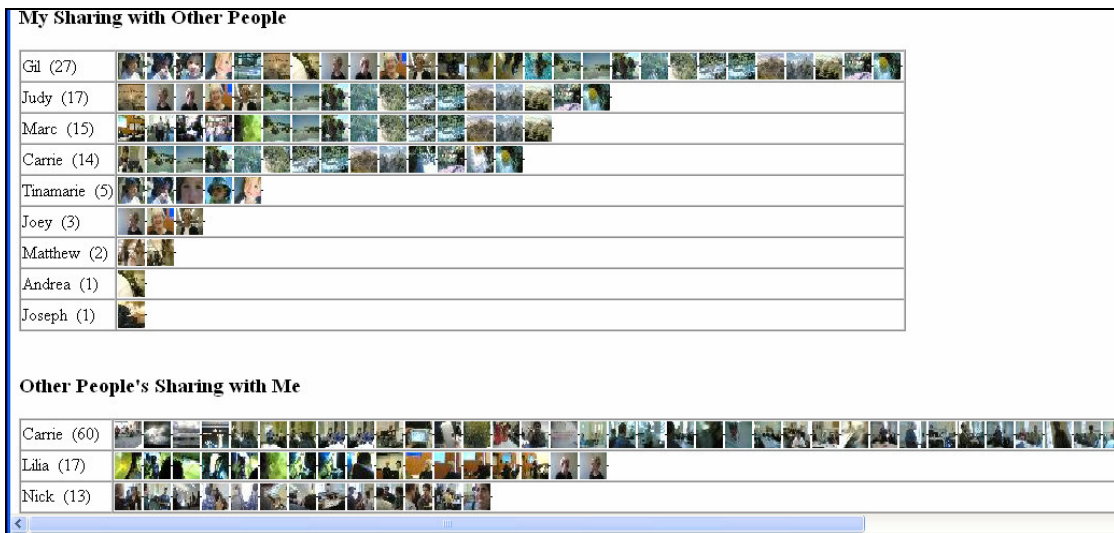
- d. Reference, sharing, receiving, and public display (*looking back, sharing, giving copies, posting online, putting up around house, receiving*)
3. General reflection and comparison (*changes over time, changes with different cameras, children or other factors that changed behaviors*)
4. Viewing pictures and asking specific questions about individual pictures

#### Photo Elicitation

Interviews, as retrospective accounts, are often limited by participants' memories and interpretations. Participants tend to speak in generalizations, talking about overall habits and not specific events. They may idealize these generalizations to fit what they believe they "should" be doing. Photo elicitation, a method developed in anthropology (Harper 2002, 17:13-26), was designed to counter this tendency by grounding the participant in specific experiences. In photo elicitation, an interviewer shows photos to participants to elicit some kind of response. In reflexive photo elicitation, the participants themselves generate the photos upon which they comment (Van House 2006). We used some form of reflexive photo elicitation in most of our interviews, looking through participants' photograph collections with them. In the second set of MMM2 interviews, we were assisted by two visualizations designed by MMM2 developers: a photo-chronology visualization that grouped thumbnail images by capture date (Figure 1), and a photo-sharing visualization that grouped images by sharer (Figure 2). Image thumbnails were small to protect the privacy of both the photographer and the subjects, but were linked to full-size versions if the subject chose to open them. Participants could generally identify the images without interviewers being able to distinguish their content.



**Figure 1.** Photo-chronology visualization.



**Figure 2.** Photo-sharing visualization.

We found that photo elicitation in general and the visualization in particular increased the specificity and accuracy of respondents’ reports on their activity. In addition, participants were often surprised by the patterns they saw in when they took pictures and who they shared with, further validating the added information provided by this method.

*Other Data Sources: Participant Observation, MMM2 Data*

Though the bulk of our data comes from interviews, we also took advantage of other data sources in our investigations. Most of the researchers in the group conducted ongoing participant observation of picture-taking and picture-sharing in our daily lives. Since we live and go to school in a heavily-touristed area, we had many opportunities to watch tourist camera behaviors. Some of us also watched and made notes on photography habits, including both picture-taking and picture-sharing, during our own vacations and at special events with family and friends.

Some researchers would discount these findings because they're "too close to home" – the environment in which we were making our observations was too familiar to us, and the larger social and cultural issues in photography were invisible to us like water is invisible to a fish. Moreover, in some of these situations we were *part* of the photographic activities and couldn't "impartially" observe them. These criticisms may have some validity; moreover, if they do, they not only discount our anecdotal participant observations I am describing here, but potentially our interviews and other data sources, too, since interviews are also a "participant observation" of sorts and cultural issues could be just as transparent in them. However, I would argue that participating in one of these situations as an "impartial" observer – for example, sitting in on someone else's family photo-sharing, or to increase the "difference" even more, sitting in on someone else's family photo-sharing *in another culture* – would *also* change the situation, and if observations were not sustained over a long period of time so that the picture built up is rich and complex, those changes would be much *more* unpredictable. Thus, although these observations were less than "impartial," I assert that they are still useful. It may also

be more or less inevitable for a researcher looking so deeply into the social uses of photography to reflect on the meanings of the photographic events in her own life.

In addition to these supplemental field observations, we had a rich data set from the MMM2 investigation, described in more detail below. We have access to all MMM2 images that were not explicitly made “private” or “restricted” as well as general MMM2 usage statistics.

We also attempted to code a random selection of MMM2 images for content, but found that coding images independent of interviews was largely unsuccessful. As Musello discussed, coding images can be problematic because of the seeming similarity of many photographs when lacking their contextual information, and the impossibility of extracting contextual information from a photograph alone (or even from the automatically-generated metadata associated with a photograph). At most, we could categorize the content of the images, but even that was difficult when we didn’t know what the photographer was actually meaning to capture and what was supposed to be the background. While we will report the results of this image coding, the results tell us very little about the social uses of cameraphones and MMM2.

### *The MMM2 Investigation*

Our interviews with cameraphone owners, as well as Kindberg et al.’s results, showed us that cameraphone usage, especially in the United States, was actually quite limited. While many people used their cameraphones to take pictures, very few bothered to find out how to take them off the phone; instead, many shared them with others in person from the handset, used them as a “photo wallet” (a convention explicitly supported in some phones), or associated pictures with the names of family and friends in

their phonebook (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216).<sup>3</sup> We wondered how much of this was due to limitations in the current technology and pricing structures, and what uses would arise if these obstacles to use were removed. In particular, cameraphone owners we interviewed complained about the price of sending pictures, unknown prices incurred by recipients, the high rate of failure in sending MMS messages with pictures, the low resolution of cameraphone images, and the technical difficulty of transferring pictures from their phones to their computers. We wanted to find out what uses would emerge with cameraphones if these features were much easier and cheaper to use.

#### Technical Specifications of MMM2

We took advantage of a donation of 70 new 7610 phones from Nokia and a donation of a year of free service for the phones from AT&T to explore this. The Nokia 7610 phones had one-megapixel cameras in them, and could take videos at .3-megapixel (640x480) resolution. This resolution was the top of the line for cameraphones in fall 2005 – in fact, we received the phones before they had been officially released in the United States. Since then, cameraphones with up to seven-megapixel cameras (basically the current state-of-the-art in *digital* cameras) have been released, and the standard cameraphone that one can get free with a service contract from most cellular providers in spring 2006 (such as the Nokia 6110 or the Motorola Razr V3) has a .3-megapixel camera (for 640x480 pictures) and video at a lower resolution. The Nokia 7610 phones were available for \$150-\$500 (price range from Froogle.com) in spring 2006.

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<sup>3</sup> For example, in one introductory undergraduate class of about 500 students we informally surveyed during a lecture in fall 2005, about 90% owned a cameraphone and about 75% percent took pictures with their cameraphones, but only *one* person out of 500 had ever sent or transferred a picture off their phone!

AT&T provided free contracts, all with unlimited data plans, for all of the phones used in the study. Though this solved many problems of dealing with highly variant data plans from various carriers, it created another: many participants did not want to fully switch to the new AT&T-provided phone number only to switch back, and others were locked into contracts with their current cellular service providers. These participants ended up carrying around *two* phones or even leaving the Nokia phone at home most of the time, only taking it out for special events like a normal digital camera. Though this effect was unfortunate, it was logistically unavoidable and we still saw lots of very interesting usage patterns despite this limitation.

Researchers in an affiliated group loaded each phone with the second generation of the Mobile Media Metadata software, called MMM2. A similar investigation was conducted a year earlier, using the first-generation MMM software on Nokia 3650 phones. MMM2 attempted to overcome many of the limitations that interview participants reported about cameraphone imaging. All images were automatically uploaded to the MMM2 server. Before uploading, users were prompted to enter a caption for the picture and to specify participants to share with immediately. This sharing took place directly from the phone. Shared pictures would either appear on others' MMM2-enabled phones if they were available for messaging, as well as in their email inbox and online MMM2 interface. Users could later log in to the MMM2 website to view all of their pictures (and all of those shared with them through the system), organize them into albums, and share them with other participants (including recipients they added to the system, such as spouses or family members, who weren't otherwise participating in the investigation).

MMM2 sported several other features to facilitate annotation and sharing. The phone would notice what other Bluetooth devices were present at the time of picture-taking, including both recognized Nokia phones that were part of the study and other unrecognized Bluetooth devices such as laptops and hand-held computers. It would place the owners of other recognized phones that were present at the time of picture-taking, and also those the participant has shared with before, at the top of the list of potential share recipients. It automatically collected other metadata, such as the ID of the cell tower(s) with which the participant's phone was communicating (a close approximation to location). In the middle of the study, we were able to distribute GPS devices that could be used with the phones to give precise GPS coordinates for all of the pictures. In practice, only a few users experimented with this device – yet another “thing” to carry around, and not completely effortless to set up.

MMM2 users can specify whether they would receive notice of new images on their phones or only via email, allowing them to specify the allowed intrusiveness of messaging. Non-MMM2 users only receive email from MMM2. This email option created uncertainty about when messages will be received, but this uncertainty was ameliorated by the near-constant online presence of many MMM2 participants: senders figured that images were likely to be received soon.



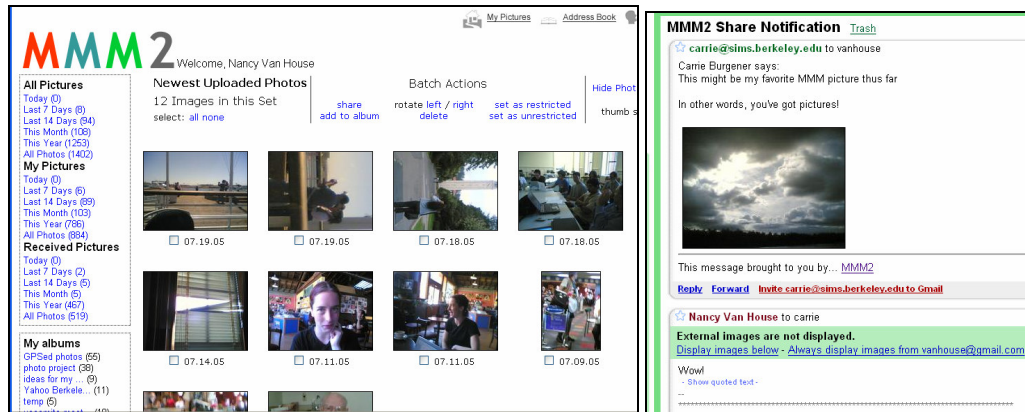


Figure 3 and Figure 4. The MMM2 interface, an email notification of a shared photo.

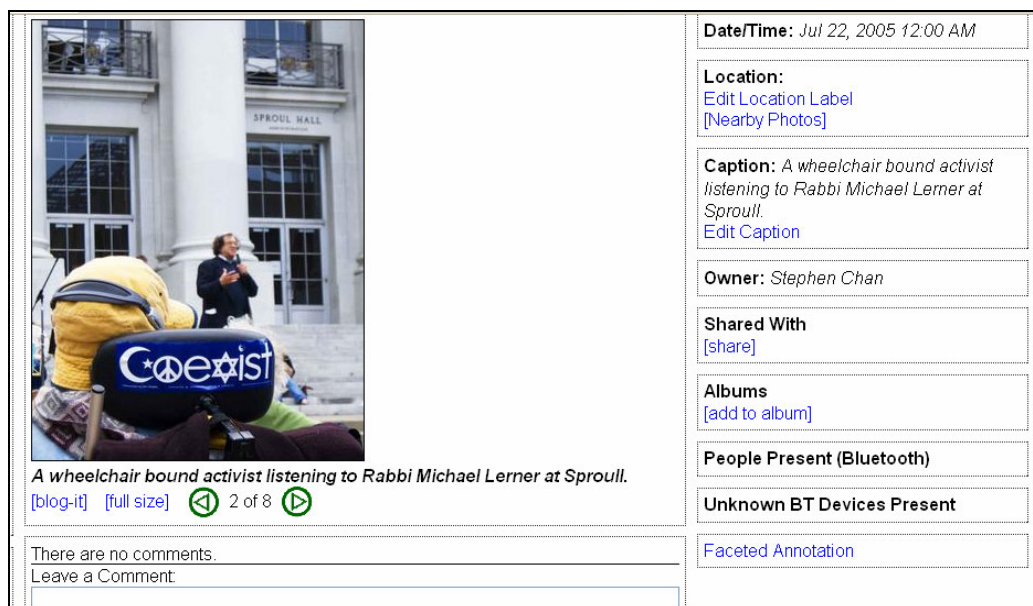


Figure 5. Detail view of a photograph, including the caption entered by the photographer and the automatically-collected metadata.

### Study Duration and Interview Schedule

Most participants received their phones on November 2, 2004, when they also signed the consent and release forms for the study. Participants who were not using the phone and did not want to keep it longer handed their phones back in March 2005. Most participants turned them in at the end of the spring 2005 semester (mid-May 2005). A

few kept them through the summer, until the remaining service contracts expired (September 2005).

We interviewed 16 of the 70 participants in February and March 2005. The following June we interviewed nine participants (including five of the participants who we had interviewed four months earlier) using a photo elicitation interface that the MMM2 developers designed for us to help participants notice patterns in their image-taking and sharing. Finally, we interviewed nine participants in March 2006 (including three of the participants interviewed a year before and two participants interviewed on both previous occasions). In this last round of interviews, we explored if and how the MMM2 experience affected their picture-taking habits and their experience in graduate school. We also conducted photo elicitation interviews with those who hadn't participated in one before.

We cast our net widely for all of these interviews, recruiting every participant who had what we defined as a bare minimum of usage, namely, they satisfied at least two of the following conditions: they took at least 13 pictures over the course of the investigation, 30 days or more elapsed between their first and last images, and/or they averaged at least 0.33 images per day. Forty-two participants out of 70, or 60%, were in this category. As mentioned earlier, many of these other 28 participants did not become "active" users because they did not fully switch to using the Nokia phone as their primary mobile phone.

Though we don't know why some students did not respond to the call for interview participants, we can guess that the demands of the program, and their absence during the summer, left them too busy to be interviewed. We can not rule out the

possibility that the most interested participants self-selected themselves for interviews, but since we interviewed over half of the “active” users and our interviewees reported a wide range of opinions on the phones and MMM2, from wildly positive to rather negative, we feel that we still were able to get a sense of the whole investigation.

Overall, we interviewed 25 of the 42 “active” participants, including eight of the 18 “heaviest” users, eight of the 24 other “active” users, and one of the 28 inactive users (see Figure 8).

#### Participant Demographics and Networks

The 70 people given MMM2 cameraphones included 40 first-year graduate students in our interdisciplinary program and 30 other students, faculty members, and affiliated individuals. The students’ average age was 29, and 62% were female. They have a wide range of backgrounds, from anthropology to fine art to computer science (with about half having a lot of previous technical experience), and most have several years of work experience before returning to school. Many are married or in long-term relationships, though only a few have children.

The student participants work together closely and also socialize, creating many overlapping social networks. Their intensive academic work, which includes much collaboration and many group projects, and the monopolization of their time by their studies means that social and professional ties within the group are strong.

This situation is unique in studies of the social uses of photography. Koskinen (Koskinen 2004) and Mäkelä et al. (Mäkelä, Giller, Tscheligi, and Sefelin 2000:548-555) also gave imaging capabilities to whole friends groups, but these groups were small, they were entirely social groups (without a work/learning component to their relationship),

and the period of study was relatively short. Other studies provided imaging capabilities to individuals who were relatively unassociated with one another; the people those participants shared with were generally not able to reciprocate using the same system. Some other researchers talked to multiple people in the same social network, but most would talk to just one member of a household or social network, so they could not explore the multiple perspectives various members of the group may hold.

In contrast, everyone in our large social group had the same imaging capabilities, and furthermore, everyone knew that everyone else was also involved. Because of this, photographing with the Nokia cameraphones became a symbolic and often highly “viral” activity (in that everybody knew what was going on when one person took out their cameraphone or shared a picture, and one person taking or sharing pictures often led to others taking out their cameraphones or sharing as well). Also, our participants interacted with one another in a wide variety of settings: social, work, classroom, and everything in between. We were able to observe and document a much richer set of uses because of this. We were also able to note instances when behavior was interpreted in different ways by different members of the group, leading to a much richer understanding of the photographic ecology.

#### The Researcher as Participant

It is important to note that most of the members of the photos research team also used the MMM2 system. This meant that we not only took and shared our own images, but we received images from others. We all, especially the student members of the team, participated in many of the collective image-generating events, e.g., student parties at which several people might be using cameraphones. We chose to participate in MMM2

because ultimately, we were part of the social networks we were studying, and to not have cameraphones would be to potentially disrupt the inclusiveness of the project and to further draw attention to ourselves as researchers (and consequently to non-researchers as “subjects” under observation).

This participant observation proved to be very useful in allowing us both to observe activity and to hone our interview questions. While participants knew who the researchers in the study were and what our goals were from the informed consent statement, many participants assured us during the interviews that they simply treated those involved in the project as peers and coworkers, not as researchers. Indeed, we found that the sharing that took place with and among those involved in the project was qualitatively no different than the sharing between participants not involved in the project.

#### The Participant as Researcher

Among the 20 heaviest users of MMM2, 15 were in some way affiliated with the MMM2 development process or user research. Five of the 20 were heavily involved in the MMM2 programming, and the other 10 were loosely affiliated. Overall, 25 out of all 70 users were affiliated. We interviewed two of the five users who were heavily involved in MMM2 development and three of the 10 participants who were loosely affiliated with MMM2 (though one of these became more heavily involved after the interviews). Our other 20 interview participants were not involved in MMM2 development or research.

One reason for this high proportion of developers/heavy users is that about half of the heaviest users joined the project after it began because they became interested first as participants. Most of these stayed involved in the project for spring semester, and went

back to being “regular” users during the summer (if they decided to keep their cameraphones). We found that many of our heaviest users adopted their cameraphones with great enthusiasm, and their volunteer involvement on the project is just another testament to that. Some took, on average, over eight images a day, and some reported that their cameraphones transformed their daily practices.

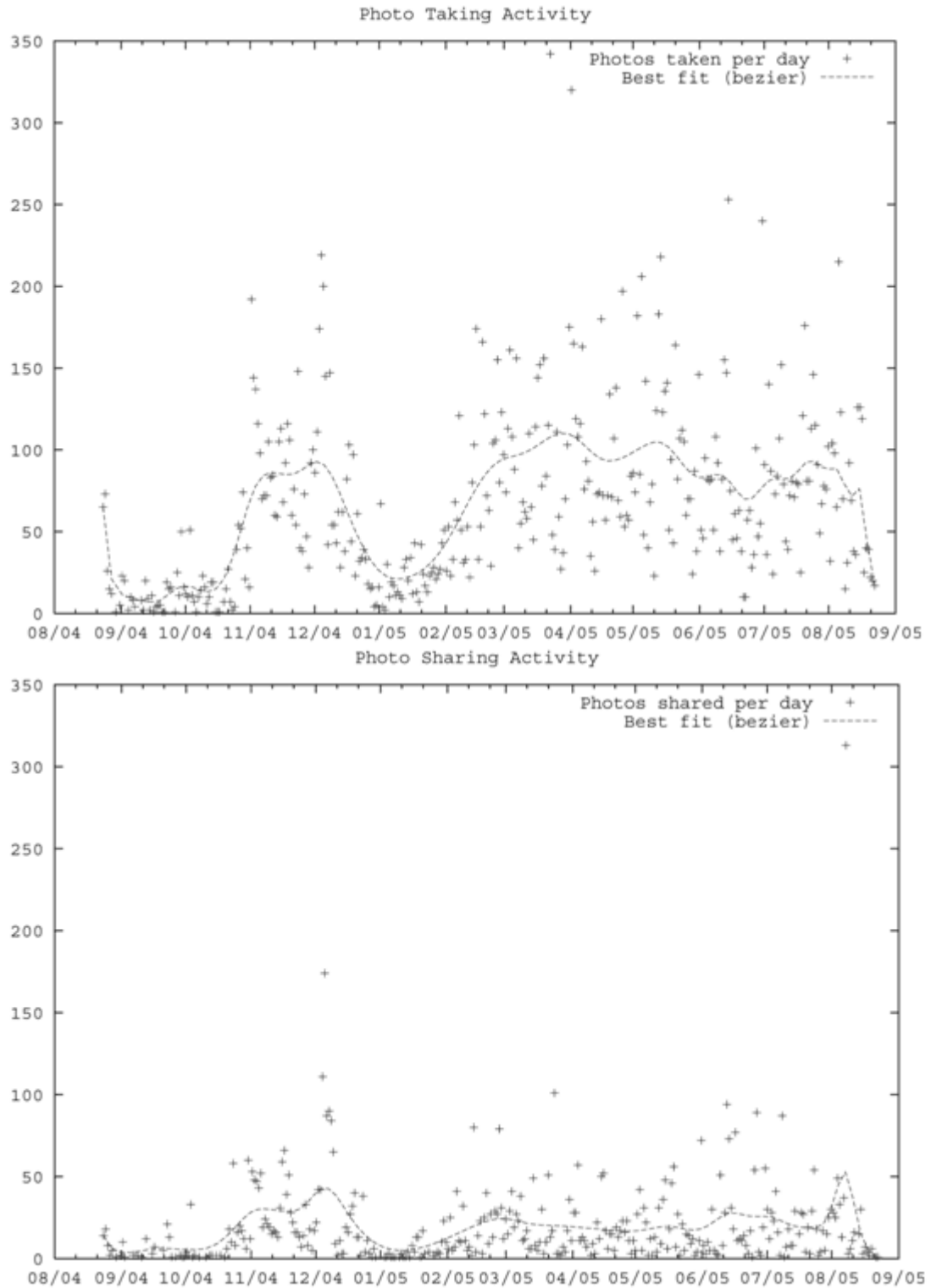
Others who had been involved in the research from the beginning of the investigation were still representative of the “typical” Information School student; they were not necessarily more technically savvy, more invested in photography, or differentiated in other ways from their fellow students, even though they made up some of the heaviest users of the MMM2 system. The pictures that these affiliates took were personal and casual like the pictures taken by other participants, and were not associated with MMM2 development activities (a few “test accounts” existed for those purposes). Though the line between participant and researcher/developer was fuzzy and fluid, we strongly believe that this did not “bias” our research in any way that it was not “biased” already (e.g. by studying graduate students in a relatively technical program at an exclusive university). Furthermore, the interest that participation in MMM2 sparked in some students is further testament that they found the system useful and compelling.

Finally, grounded theory, a major qualitative research approach and the basis of our analyses (see below), stresses that the researchers’ own experience is not to be ignored but should be treated as field observations. It is impossible to escape our own experiences, so instead of ignoring them we should acknowledge them, explore the ways in which they affect our outlook, and integrate them into our analysis. Overall, researchers’ experiences are as valid as those of any other participant, no more, no less.

*Grounded Theory Analysis*

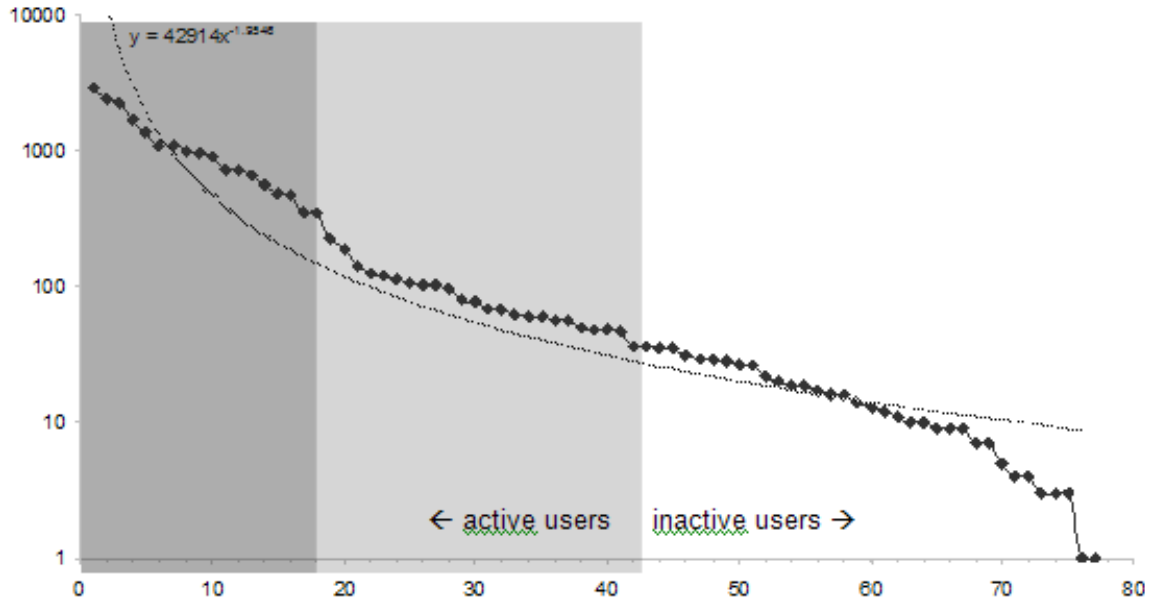
We use grounded theory as our analytical approach (Clarke 2005; Glaser and Strauss 1967) which begins not with theories and categories but with observation to iteratively generate conceptual categories, conceptual properties of categories, and relationships among them. Grounded theory draws on all kinds of evidence: interviews and field observations, documentary evidence, and the researchers' own knowledge. As stated above, since there is no "view from nowhere," this is included explicitly. Grounded theory a process of continual comparison, searching within the data for new insights, and seeking out new data to expand or refute the emerging theories and clarify and deepen areas of the data that are incomplete or difficult to understand.

While qualitative methods are essential to understanding the uses of images and the interpretations of the cameraphone, they are realistically limited to small numbers. Even though our study was relatively large-scale (with 70 participants) and fairly homogeneous (in that all participants had a shared context even though their backgrounds were diverse) compared to other qualitative investigations of photography, we still saw a fair amount of variation, suggesting that we should be cautious about generalizing from all small samples. A healthy skepticism is required in consolidating the findings of research among different user groups such as different cultures, age groups, or other life conditions. Grounded theory is very careful about generalizing from specific studies. The grounded theory approach, called theoretical sampling, involves studying new types of users or conditions of use as the emerging theory suggests appropriate comparisons, and asking how previous findings are extended in these new settings.



**Figure 6 and Figure 7.** Photos taken and photos shared by day, from September 2004 to September 2005. A peak in November 2004 (when most participants received phones) is followed by a lull in late December 2004 and early January 2005 (when many students returned home for Christmas), then by a fairly steady rate of photo-taking and photo-sharing as more stable, enduring use patterns settle in.





**Figure 8.** The 70 participants in the MMM2 investigation took between 0 and over 3,000 images each. The distribution roughly fits a power law curve (see best-fit line; note logarithmic scaling on Y-axis). We interviewed 25 of the 42 “active” users (in the shaded box above), including 8 of the 18 heaviest users (in the darkest shaded box above).

## Results

As of September 2005, at the conclusion of the investigation, participants had taken 24,412 images with the MMM2 system, or an average of 76 images a day for all participants combined (see Figure 8). This excludes a small number of images deleted by the photographer from the MMM2 system and includes a small number of non-cameraphone images manually uploaded to MMM2 for sharing, both statistically insignificant. Though only a small number were deleted, we must assume that images that participants find potentially offensive, incriminating, or personal are underrepresented in the study.

The length of our study allowed us to notice enduring uses as the cameraphone shifted from novelty to daily device. The time-based visualization used in the photo elicitation interviews (Figure 1) often showed a burst of images in the first few days,

settling into a more consistent long-term pattern. This shows that longer-term studies, where participants are given time to overcome the novelty factor of a new technology, are essential to finding out how people adapt new technology to their higher-order, enduring activities.

### *The Social Uses of Cameraphones*

We have previously identified four higher-order purposes, or *social uses*, of personal photography (Van House et al. 2004): creating and maintaining social relationships; constructing personal and group memory; self-presentation; and self-expression. We don't expect cameraphones to be used in exactly the same ways as other cameras, but according to Activity Theory we do expect some continuity of use, as well as emerging uses particularly suited to cameraphones that fulfill some of the same higher-order activities as people find ways to fulfill their intentions in new ways with new technology. We have found that these social uses have indeed proliferated to cameraphone use, with some differences. In addition, we have found other emerging uses for cameraphones.

### Memory, Identity, and Functionality

Photography is deeply tied to our feelings about transience, time, and mortality, both our own and others'. Popular discourse says that photos preserve memories. It may be more accurate to say that we *construct* individual and group narratives of ourselves and our lives.

People delegate various responsibilities to nonhumans (Latour 1995:257-277), including offloading to photos the task of remembering. In addition, photos freeze the

flow of time, allowing us to focus on details and to see the past through our knowledge of the present (Benjamin 1931; Berger 2001:286-293; Sontag 1977).

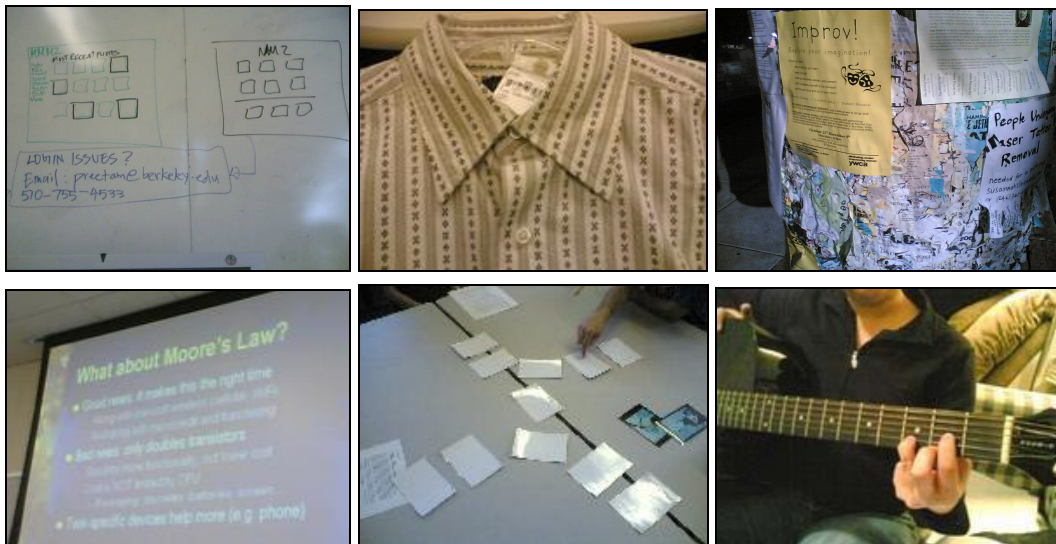
Photos don't simply reflect but may construct an event as photo-worthy and memorable (Sontag 1977). Having the picture as mnemonic ensures that the occasion is remembered; an otherwise unmemorable occasion may be remembered specifically because photographs of it endure. The making of these memorable events works reciprocally: the very presence of a camera, and the *act* of picture-taking, signals to the participants that the occasion is photo-worthy and memory-worthy. This "signaling" is discussed further below.

**Quote 1.** [I take pictures because it's] "fun ... we are social ... [when others take pictures I ask myself,] 'What do they see, what are they doing, are they having more fun than me?'"

Cameraphone images were used as memory devices in several ways. Some photos served "functional" purposes as short-term memory devices. Others were taken with the intent to chronicle one's life for later reflection or to chronicle group activities for personal or group use.

#### *Functional Memory*

One use, which is fairly common with cameraphones but very rare with other kinds of cameras, is the taking of functional images for oneself and for sharing with others. As image quality improves, it is increasingly possible to use cameraphones as scanners or copy machines (Figure 9). Participants recorded memos for themselves such as books they wanted to buy, flyers about events they wanted to remember, or items in stores they were considering buying. They also used cameraphone images for recording project work and artifacts, such as whiteboards.



**Figure 9.** Functional memory images: (a) whiteboard contents, (b) a nice pattern on a shirt to buy, (c) a flyer, (d) an interesting slide, (e) a flowchart brainstorm, (f) a guitar chord.

### *Life Chronicling*

Photos have long been used to construct individual and group narratives and identities, to make a coherent story out of the moments of our lives. Another notable use of cameraphones was their use for *everyday* chronicling of life (as opposed to the chronicling of special events common with other cameras). Most of our active cameraphone users engaged in steady, low-level picture taking – many days with one, two, or three pictures. Many of these regular, mundane images featured the artifacts, experiences, and sights of their daily lives and functioned as “personal archiving” (Okabe 2005). Sometimes this began as experimentation or playfulness but people then realized that they were building an ongoing narrative of daily life that took on greater significance when viewed as a set, as evinced by Quote 2 below.

There is a long tradition of journal-keeping. However, journals are always retrospective accounts, even if only by a few hours; the cameraphone life chronicle is a real-time record. It is, of course, most amenable to experiences that can be represented by images, directly or indirectly.

**Quote 2.** “It’s like a chronicle of life ... I just like to save pictures and archive points in my life. ... I have a very strong sentimental streak. [The cameraphone] was just a very easy way of saving different points and I could come back and look at them and get a feel for where I was and where I’ve come ...”

### *Group Memory*

Images are also used to construct group identities and narratives, which also contribute to relationship construction and maintenance, discussed below. We saw many images recording group events and activities, both social and academic. One participant documented the progress of a collaborative technical art project in pictures, culminating in the opening night an art installation. Though he reported initially doing this for his own archive and for the enjoyment of picture-taking, he later used the images on the group’s website to illustrate the development of the project.

Another participant took several hundred cameraphone pictures during his union’s 3-day labor action, because he thought that the union should have a record of such a significant event. The automatic uploading feature of MMM2 made it easy to post these on his website and send the URL to union members, creating a group archive. In addition, the perceived casualness of the cameraphone, along with his union t-shirt, made possible pictures that otherwise might have been seen as threatening.

Sometimes cameraphone pictures are of interest to an even wider audience, becoming a tool for *cultural* memory creation and preservation. For instance, cameraphone pictures of the aftermath of the London Tube bombing in July 2005 (Figure 15) were published in newspapers around the world.

## Relationships and Communication

Among this group, communication using images became common. Once the novelty wore off, sharing declined to a relatively steady state. Images were often incorporated into other communicative mechanisms, including email and instant messaging. Participants reported value in sometimes being able to show their interlocutor what they were talking about, or in sending an image that stood alone as a complete communication. While some of the sharing was function, much of it was relational. Images became one more resource for communication and relationship maintenance.

Nardi (Nardi 2005, 14:91-130) shows that casual communication in both social networks and the workplace is often intended to create a feeling of connection, which facilitates continued interaction over time. Researchers studying family photography have found that photos play an important role in “togetherness” (Rose 2004, 5:549-564). We found that connection was important among our student participants across their many activities together. Our interviews confirmed that people tended to share repeatedly with a few individuals in stable, often non-overlapping groups, including class project groups and other peer groups.

The MMM2 system was designed to facilitate sharing. However, we found that only 22% of the images were shared within the MMM2 system. Through interviews we discovered that this figure understates the actual sharing of MMM2 images in two ways. First, participants would sometimes take redundant images – usually two or three, sometimes more – in order to ensure that one turned out well, and then would only share the best one. Second and more important, not all cameraphone images were shared using the MMM2 system directly. The participant’s method of sharing was usually consistent with established communication practices with a specific recipient and with the perceived

capabilities and preferences of the recipient(s). Images were shared as email attachments outside of MMM2, by sending image URLs in email, or even by embedding URLs in instant messaging conversations. Many participants estimated that they shared more images outside of MMM2 than within the system. When deciding how to share an image, participants considered (1) their on-going patterns of communication with the recipient (e.g., email, IM), and (2) their perception of recipients' technical capabilities and resources, such as access to broadband.

Surprisingly, only 6.7% of images were sent directly from the phone (or 30% of shares), even though the service was free. Some participants reported problems (especially involving slowness of the interface) with sending images from the phone and showing them from the phone to co-present others, reducing these two activities that others have found to be common (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216; Okabe 2004). In addition, many participants liked to view the full-size images on a computer screen before sharing to select the best images to share (also observed in photobloggers, e.g. see Cohen 2005, 27:883-901), and the MMM2 system allowed for easy sending from the web interface which many users preferred to the slow phone interface.

Participants reported taking some pictures with the intention of sharing them, and taking other pictures for personal reasons and deciding to share them later, often because they turned out particularly well (by the participant's personal criteria). In some cases the focus of sharing was the image itself, what Volda and Mynatt (Volda and Mynatt 2005:171-189) call "image as object"; in other cases, the image was an instrument, a means toward a communicative end.

Sharing was carefully calibrated with the nature of the relationship and the content of the image. (The strength of time of capture in predicting image sharing was presumably due to a correlation between time and content, e.g., a weekend party versus a weekday class.) Images were often shared with people who were in the picture or present at an event or “should have been” – people considered to be part of the group who missed a group event. Another basis for sharing was the photographer’s view of which images a recipient would find funny or interesting.

Image-sharing was often reciprocal. Participants reported that they did not feel a need to respond to a picture with another picture, but an image sent opened the door to further sharing. Image-sharing often helped to reinforce a relationship by adding a new, often casual or humorous, element of communication. For example, two of our participants who both shared many more images than they received did not expect images in return; they shared because they thought others would enjoy the images that they sent.

Though reciprocal sharing was common, it was not expected. Some people took and shared many images with many people in a broadcast mode. This imbalance was generally acceptable to all concerned. These heavy sharers were sensitive to whether others were interested in their images, and responded to cues indicating whether their images were welcome.

From the interviews, we learned that sharing usually took place within about 24 hours of image capture. Participants reported that if sharing didn’t happen within a day, it was usually forgotten. Furthermore, many images had a short useful life. This highlights another important characteristic of cameraphone images: although some have enduring value, many are highly transitory, with little expectation of future value. Some may prove



to have an unexpectedly enduring value, such as a picture that takes on added importance due to subsequent events.

### *Communicating with Images*

An important use of cameraphone images was for communication. While some may say that all photography is communicative, this is not the case in the narrow sense of being intended as a message to others. We found that cameraphone images were often used to create an immediate and on-going sense of connection using a shared understanding of intent, a finding echoed by Koskinen, Ito, and Okabe (Koskinen, Kurvinen, and Lehtonen 2002; Okabe 2004).

Similar to their uses for functional memory, functional images are often more efficient and effective than text. The ubiquity of cameraphones makes it easy to capture and send such images (Figure 10). Image-based communication can also increase the complexity of what can be conveyed. When a participant got an instant message asking if she was still in a meeting, she sent back a cameraphone image of the meeting leader, to prove that she was indeed still in a meeting (and the reason for the meeting running overtime was the person running the meeting), taking advantage of a shared familiarity of the meeting participants and the leader's tendencies to run late.

Kindberg et al. (Kindberg, Spasojevic, Fleck, and Sellen 2004, HPL-2004-216) talk about functional versus affective uses of cameraphone images among the people they studied. We see this as a continuum. Among our participants, even highly functional communicative images often had a light-hearted component. For example, to remind his work group that time was running out, one participant sent his team a picture of a clock. This is also an example of something else we frequently saw: image-based messages

were often telegraphic, highly indexical, and situated, with little meaning for anyone other than the sender and recipient, and with a very short period of viability.

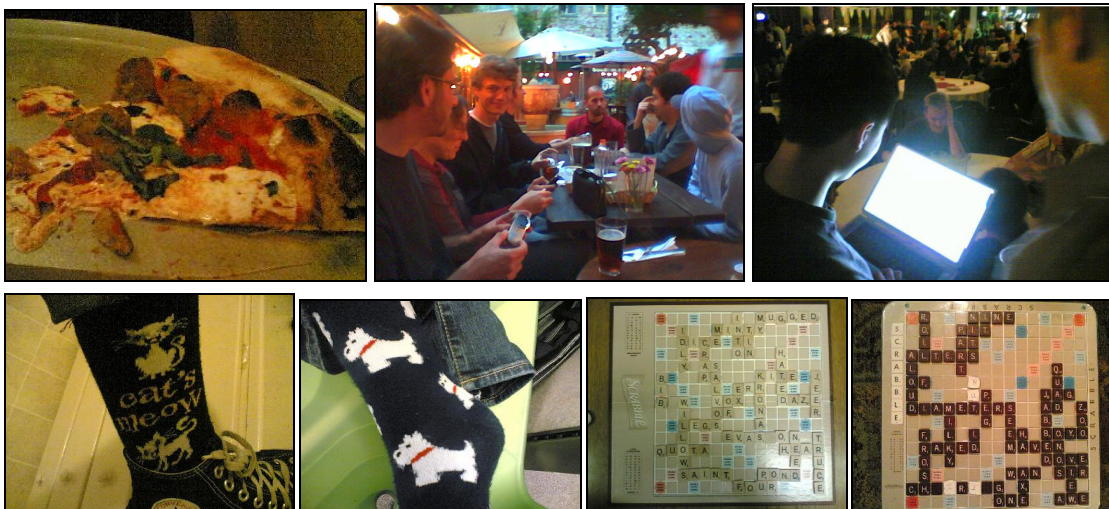


**Figure 10.** Functional communication with images: (a) blinds to be fixed, (b) “In traffic and will be delayed,” (c) deadline looming, (d) unknown error, (e) transit rules for a friend, (f) package arrived.

Like Nardi’s finding that workers sent friendly instant messages to co-workers over the weekend, we found our participants using images simply to establish a connection with other participants (Quote 3). Some communications were synchronous: when two students were working late at night, separately, on an assignment due the next day, one sent the other a photo of a coffee pot. Others were asynchronous: people often took and shared pictures of things that they thought others would find useful, funny, or interesting, in order to maintain friendships or to reinforce a particular perception of themselves in the group.

**Quote 3.** [I took and shared pictures of] “anything of which I would say to myself, ‘I wish so and so was here right now so they could see this’ ... I run into that stuff every day.”

Among our participants, cameraphone images gave people a way to connect through humor and shared interests, which in turn could help to establish trust. We tend to trust people who are like us and people with whom we have things in common, even if those similarities are not directly related to the work in question. These similarities “can range from the relatively superficial, like friends who share a love of cooking or hiking, to highly complex, like the value systems underlying organized religion” (Fukuyama 2001, 81:479-494). Informal communication not related to the task or the task environment can help create this sense of connection and similarity. Some participants shared images of their pets with one another, cat owners with other cat owners, and dog owners among themselves, with dog and cat owners rarely crossed those lines except in a few playful “contests.” Others shared humorous images of socks (a picture of pair of socks with dogs on them were answered by a pair with cats) or scrabble boards.



**Figure 11.** “Affective” or relationship-building communication with images: (a) “real” pizza from New York, (b) friends at a social event, (c) “geeking out” at a party, (d-g) two photographic “conversations” (dog vs. cat socks, Scrabble boards)

### *Relationships*

Pictures of family and friends help to reinforce relationships both by who is in them, how they are arranged, and what is done with them (Rose 2004, 5:549-564). In the

past, most personal photography consisted of images of family and friends or perhaps co-workers socializing outside the workplace. People generally did not have cameras at hand during the workday, and moreover, photographing people at work was considered taboo; one of the primary purposes of photography was to show the family at leisure, the ideal state (Chalfen 1987; Musello 1980, 6:23-42; Slater 1995:129-146). Cameraphones, however, are always present: the ubiquity of cameraphones and the improving image quality result in many casual pictures of people engaged in daily activities, including work.<sup>4</sup> A large proportion of the images that we saw people were groups of students engaged in both work and social activities, on campus and off. One participant enjoyed actively documenting her project groups' progress in pictures (Quote 4), and sharing the pictures with her group members.

**Quote 4.** "I take pictures when I work in groups. I took pictures of projects, documenting what people need to turn in. [I take these] just because I think they're kind of fun, and we can post them on the group website and say, we met and here's what we're doing, and here's a picture of someone staring at their computer, or doing this or that, or writing on the board."

Participants often described "good" pictures as those of people, in which the participants looked good, and with emotional content that express the emotions of an event, especially people having a good time. This is in keeping with Chalfen's and Musello's observations about image framing, editing, and content: apart from a minimum standard of quality, the most important element in pictures were the people and how they looked (Chalfen 1987; Musello 1980, 6:23-42). Cameraphone participants often gave one another pictures in which the recipient looked "good."

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<sup>4</sup> The always-present nature of cameraphones has led some companies to ban them in the workplace in fear that they will be used to copy and smuggle trade secrets. For example, IBM Research only recently lifted this ban on cameraphones (personal communication, David Gibson, IBM Almaden).



**Figure 12.** Work-related images: (a) department building, (b) keyboard, (c) giving a presentation, (d) in class, (e) a project group at work, (f) working together in the student lounge

### *Sharing One's Life Using Images*

Some respondents kept distant others such as family members in other states informed about the daily nature of their lives via images. For our participants, this often helped to bridge the gap between campus and home. One participant who had moved from afar to attend graduate school sent hundreds of images to her distant boyfriend. Another shared images in person off of her handset with her husband as part of their daily conversation about her day (Quote 5). She spoke specifically of valuing this for its role in maintaining their relationship.

**Quote 5.** “It’s nice when I can take photos and say, ‘Hey, this is what I saw today,’ or ‘This is my friend, this is the one I always tell you about.’”

### Self-presentation and Self-expression

People engage in many kinds of self-presentation (and self-representation<sup>5</sup>), influencing how others see them (Goffman 1955). Image creation and especially sharing is often a form of self-presentation. Any kind of image can be used for this purpose. Cameraphones were often seen as less serious than other cameras, so images that might normally be considered narcissistic, such as self-portraits, were instead considered playful and acceptable. Participants did show us a large number of self-portraits during interviews. Other forms of self-presentation include pictures of one's belongings, pets, space, friends, and events; humorous images, as way of saying, "This is what I find funny"; and artistic images saying "Here's where I see beauty."

By self-expression, we mean the creation of images that express one's own view of the world – images that are "artistic," funny, experimental, or otherwise expressive. They may or may not be shared. Self-expression is about exploring and expressing our "authentic" self, or our unique view of the world.

Self-expression and self-presentation are closely related, since we often seek an audience for our artistic or humorous expression. But whereas self-presentation focuses on influencing others' view of oneself – which may be manipulated, partial, or in some other way a performance -- self-expression is focused on giving voice to one's view of the world. Again, the act of photography and not just the image is often important. Self-expression is often more about the act of photography than its product.

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<sup>5</sup> In his discussion of photography, Slater (Slater 1995:129-146) distinguishes self-representation, which is done retrospectively and cumulatively, from ongoing and fluid self-presentation.





**Figure 13.** Self-presentation and self-expression: (a) self-portrait in a mirror, (b) tree silhouette, (c) friend down a tube, (d) cobblestones, (e) “Punk rock accordion workshop,” (f) experimenting with light, (g) curves, (h) clouds and tree, (i) clouds

Our respondents took quite a few photos of this sort. The ubiquity and perceived playfulness of cameraphones made this kind of picture-taking more likely, allowing people who did not see themselves as “artistic” to experiment with creating aesthetically-pleasing images. Several participants said they felt intimidated by “real” cameras, even digital cameras, but felt that cameraphones were less serious and thus felt more comfortable using them in this way.



**Figure 14.** (a-d) One participant's self-presentation through self-portraits. Several participants reported being more comfortable taking self-portraits with cameraphones because it was "playful."

#### Summary of Social Uses

The cameraphone is used in ways similar to other kinds of cameras, but its ubiquity and casualness mean that, when image quality is sufficient, it is also used in many other ways. From our observations we conclude that the cameraphone is, in the interpretation of users, at least three different devices: a *memory-capture* device, a *communicative* device, and an *expressive* device. For any one person the cameraphone can be any combination of these.

While the uses of photos in familial relationships is well-documented, we argue that, with the proliferation of digital cameras and especially cameraphones, and easy internet-based sharing and display, we will see images play more varied roles, including among workgroups as well as social groups. Cameraphones are interpretively flexible and can be used for a variety of high-order motives or activities.

As *memory-capture devices*, like other cameras, cameraphones can take enduring images of personally and collectively memorable events, that contribute to personal and group identity and narratives. Their ubiquity makes them valuable for unexpected opportunities and for mundane images, the texture of everyday life. They are also useful for functional memory or reminders.

As *relationship devices*, cameraphones are useful in maintaining connections. Images of groups and group activities reinforce group relationships. Image sharing



reinforces connections. Cameraphones, especially when they are networked, are useful for image-based communication, which in some cases is most effective and multi-layered. Many such images are highly transitory and indexical, as is much communication. Some are about the content while others are about the connection between individuals.

*As expressive devices*, cameraphones are used to capture images, including art and humor, that express the photographer's sensibility and view of the world. Expressive use includes not just the image, but the act of taking images and the development of "photographic seeing." The ubiquity and perceived playfulness of the device, plus the instant feedback of digital imaging, encourages experimentation.

Finally, the cameraphones themselves became highly personal devices "expressive" of the personality of its owner. Though keychain attachments for mobile phones are not as popular in the United States as they are in Japan, many have a personalized image as their background for their cameraphone screen. Moreover, whereas digital and film cameras may be seen as belonging to a household and are often loaned to others, respondents told us that the cameraphone *is more personal, more individual, and more private*. One respondent spoke of giving the device to another person to capture an image reluctantly, because it was his phone, whereas handing a camera to another to take a picture of oneself is a common photographic practice.

### *Photographic Events*

An alternate analysis of our data, slicing the results in a different way, takes advantage of the photographic event framework proposed by Chalfen and Musello. With

this, we can explore new aspects of cameraphones, digital photographs, and online sharing, and compare them more directly with past activities.

### Planning

Musello found that specific pictures were rarely planned, but that individuals made sure to have cameras on hand during special events (Musello 1980, 6:23-42). We found that spontaneous picture-taking happened even more often with cameraphones; their always-present nature enabled many more photographic opportunities, since cameraphone owners don't even need to plan to have their cameras with them in order to take a picture. Cohen corroborates these findings with his discussions of photobloggers. Some of his participants wished to eliminate the planning stage altogether, minimizing the distance between experiencing an event and photographing it (Cohen 2005, 27:883-901).

We found that most regular MMM2 users showed two patterns of image-making overlaid. In general, few people carry non-cameraphone cameras regularly, so film and digital camera image-making is intermittent. We found this pattern with cameraphones too, where special occasions or exceptional opportunities (e.g., an unexpected camera-worthy event) resulted in spikes of picture-taking. Some interview participants reported carrying *two* cameras on some of these occasions: their cameraphone and their "real" digital (or film) camera.

The second pattern, however, is unique to cameraphones: because cameraphones are always present, they promote regular, low-level use, consisting of a few pictures a day. (The distribution shown in Figure 1 is typical.) Some participants told us that they had radically changed their daily habits as image-making became an ever-present element

of their daily activity. A few who had given their cameraphones back before the interviews in June 2005 told us that they missed them a lot and wished they had kept them longer. Combining the social construction of technology with activity theory, we theorized that people use cameras, including cameraphones, to fulfill higher-order activities or motivations. We expected that cameraphones might be used for many of the same activities as those for which other cameras are used. However, we expected that we might also find participants using cameraphones for activities for which regular film and digital cameras are not well-suited.

#### Shooting (and first-pass editing)

Like planning, the shooting event has undergone a transformation since the time of Chalfen's and Musello's reporting. The *act* of picture-taking has always been important, but with the ubiquity of cameras and the perceived "playfulness" of cameraphones, people have begun to respond to a camera's presence in different ways. Among our participants there emerged a practice, which we termed "signaling," of labeling events as important, funny, or otherwise noteworthy by bringing out the cameraphone (and sometimes several at once; see Quote 1). In these instances, the captured image may be less important than the playful act of image capture itself.

Whereas now in the US it is often considered rude to have one's phone out and at hand while with other people, our participants reported that having the cameraphone at hand and using it during interactions with others was not only accepted, it was sometimes expected. We conjecture that this was due in part to the camera's social nature (e.g. with "signaling") and the lack of division between photographers and subjects, as well as habituation to the presence of cameraphones in everyday usage.

Many participants highly valued spontaneous pictures, as Musello also found. Unlike Musello's participants, the commonality of the cameraphone better enabled our participants to obtain spontaneous images without their subjects quickly posing themselves before the shutter snapped. Of course, there are still many posed images, but subjects don't seem to feel the *need* to pose quite so acutely anymore. This intriguing preliminary finding warrants further investigation.

Finally, technological innovations in both digital cameras and cameraphones have compressed the shooting and the first-pass editing events while simultaneously providing the subject with much greater control over their self-presentation, as it was captured by the camera. LCD screens on digital imaging devices allow for instant review of images, and most allow for deletion from the device. In our field observations, we observed many, many instances of the photographer showing the subjects a picture she took on the spot; sometimes they would subsequently re-stage the picture to try to improve some aspect of it. This may be another reason why photographic subjects are more comfortable with spontaneous images: they can easily review the image and insist that it be deleted if it does not give them a favorable presentation.

### Processing

Musello's "processing" event, largely taken for granted by his participants (Musello 1980, 6:23-42), has now been all but eliminated: the taking of the image, exposing the camera's CCD<sup>6</sup> to light, is also the processing of that image. There can be problems specifically associated with this "processing," for example, the CCD fails or the

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<sup>6</sup> CCD is an acronym for "charge-coupled device." Like film, CCDs can record light; like a computer screen, they do so in discrete units called "pixels." The resolution of a digital camera refers to the number of pixels in its CCD.

conditions of the photograph go beyond the normal technical parameters of the CCD (e.g. taking pictures of the sun). Apart from these errors, digital photo-takers normally take processing even more for granted than Musello's participants did.

#### Other Editing Events

Like Chalfen's and Musello's participants, our participants would often go through photographs after uploading them to their computer to cull "bad" pictures, though some never deleted any pictures, no matter how "bad." Sorting of digital images is often done automatically by a computer's operating system or image software. Participants still feel some obligation to do some editing of images. Though many online photo-hosting services make it very relatively easy to post "albums" of pictures, many participants still fall behind or feel that they don't do enough. Several of our cameraphone users reported that if they didn't "do something" with a cameraphone image within a day or two of taking it, they never did. Cohen's studies of photobloggers (Cohen 2005, 27:883-901) also found this.

A few of our participants reported doing other editing on their images, sometimes extensive. Editing capabilities have gone far beyond those that existed at the time of Chalfen's and Musello's studies: not only can people crop images and put them in albums or other collections, but with Adobe Photoshop and other editing programs, they can manipulate the content of the image itself in fairly radical ways.<sup>7</sup> Some researchers have expressed concern over this assault on "the Real" (Lister 1995:1-25), while others said that photographs were never really "real" anyway (Sontag 1977) and digital editing brings this to light (Chalfen 2004, 17:141-149; Oravec 1995, 29:431-446).

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<sup>7</sup> Some websites such as Fark.com have "Photoshop contests" where a digital image is posted and participants edit the image in clever or humorous (often vulgar) ways.

## Exhibition

Exhibition opportunities have also changed with new technologies, though the activity of sharing experiences with close friends and family has not. Many of our participants maintain publicly-available photo sites or photoblogs where they post their images for the general public. Viewing is no longer only a family activity, and the event itself is stretched over time and space with the advent of online albums, sending pictures through email, and other remote sharing activities. It divides the photographer and audience in a way that most photographers didn't like, since they like to receive comments on their photographs. Some audience members *did* like the change to online picture-viewing, since it gave them control of the pace and depth of the slideshow (though they also acknowledged missing the stories associated with some pictures). Some overcame this by talking over the phone while remotely looking at pictures.

Like Musello found, our participants usually made only a portion of the pictures they had taken available for exhibition. While a few would post *all* pictures online, most posted between one quarter and one half of the pictures they took, keeping the rest on their own hard drive and rarely looking at them. Others only send images through email or instant messaging, often consistent with other modes of communication. Many expressed concern over the privacy of their images and the potential for re-appropriation and misuse, but few actually restricted access to their online albums. The most common form of security was "security through obscurity": participants would sure their photos page wasn't linked from other pages and thus would not be indexed by search engines. A few had password-protection.

The increasing prevalence of cameraphones has led to more photographs of unexpected but newsworthy events than ever before, allowing casual photographers

exhibition possibilities usually reserved only for professionals. Survivors of the London Tube bombings in July 2005 snapped cameraphone pictures of the bombing and evacuation (Figure 15). Public pictures can also be used to exert social control, a sort of distributed “Big Brother.” For instance, one Korean cameraphone owner snapped a picture of an unrepentant subway rider and the mess her dog made, posting it on a popular Korean website and publicly shaming her (Figure 16a). Of more local interest, Yahoo! employees post pictures of fellow employees’ egregious parking jobs in their overflowing lots to shame bad parkers (Figure 16b-c).



**Figure 15.** An unexpected newsworthy moment: the London Tube bombing in July 2005.



**Figure 16.** Unexpected newsworthy moments: cameraphone images posted for public shaming. (a) a dog’s mess – and owner – on the Korean subway, (b-c) bad parking jobs in a crowded lot.

### *Communicational Components of Photography*

#### Participants

Musello, Chalfen, Rose, and others focused specifically on families in studying family photography. Others have focused on individuals or small friends groups, following them for a short amount of time. Our study followed a large number of people over a longer period of time. Moreover, our interviews investigated participants' entire photo-taking lives.

Overall, it seems that more people are getting involved in the creation of photographs than ever before, at more ages, and for more purposes (far beyond just "family photography"). Even those who do not take pictures themselves are inevitably made the *subject* of many pictures, from their driver's license or identification cards or the closed-circuit security systems<sup>8</sup> to the many pictures taken by family, friends, or bystanders at special events or just day-to-day. The audiences of pictures are in flux as well: while many still take pictures for family or close friends, others such as Cohen's photobloggers post pictures online for the general public.

#### Settings and Topics

Many pictures are still "context-free," which Musello commented on, showing people but giving little information about setting unless the setting was in some way extraordinary. But in general, the boundaries between acceptable and unacceptable settings are breaking down. Private rooms are no longer particularly taboo, nor is the

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<sup>8</sup> Some are unhappy with being unwitting subjects of photography and video in their daily lives. One member of the New York Civil Liberties Union has been maintaining a map of all of the surveillance cameras in New York City. (See <http://www.mediaeater.com/cameras> for more information.) Some countries also require that cameraphones make a noise or flash a light so that it is more difficult to capture photos surreptitiously.



workplace (or classroom). Similarly, the topics of pictures are expanding outside the traditional holiday or vacation snaps to include many everyday pictures and functional pictures. (Cohen’s photobloggers even actively disdained “traditional” holiday/vacation pictures.) Digital cameras and cameraphones allow users to “celebrate” the mundane, since the cost of taking more pictures is more or less free and cameraphones in particular are always present. See Figure 10, Figure 12, and Figure 17 for examples of work images, functional images, and other images with settings and topics that would be considered “unconventional” in the family photographs that Chalfen, Rose, and Musello studied.

#### Code

Musello and Chalfen both noted that while cultural codes are surprisingly regular across different picture collections, extracting codes from pictures alone, without personal context, is not possible (Chalfen 1981, 4:106-113; Musello 1980, 6:23-42). In our own research we tried to code a random selection of 400 (public) MMM2 images and ran into the same problems. Without the photographers’ interpretations, our ability to infer meaning and intention from these images was very limited. Images were categorized according to their apparent subject (where the subject is featured prominently



**Figure 17.** Examples of cameraphone images with “unconventional” settings or topics: (a) a portable bathroom decorated for Christmas, (b) beer bottle in a garbage can, (c) applying makeup in the bathroom.

in the pictures, and usually takes up most of the picture area) and whether they were taken at night, indoors or outdoors, and on campus or not.

In our sample, 49% of the images were of people. Of those, 52% contained one person, while only 22% contained 3 or more people. Only 7.7% of images with people in them were images of children, since few of the participants were parents. 49% of the images with people in them featured other members of the Information School, and 5.1% were self-portraits.

The most common nonhuman subjects were text (15%) and technology (14%). Indoor images (35%) slightly outnumbered outdoor (29%; the rest were ambiguous), and 20% were taken in South Hall (the Information School building) or on campus. 21% of the images were captioned, 39% of those with descriptive captions (reiterating what is in the picture), 41% with informative captions (giving context), and the rest with unintelligible captions.

Photograph Subject or Context (N=400)	Percent of sample
People affiliated with SIMS	49%
Self-portraits	5.1%
Text (whiteboards, signs, etc.)	15%
Technology (mobile phones, computers, etc.)	14%
In South Hall (the iSchool building) or on campus	20%

**Table 2.** Results of coding analysis of 400 randomly-selected MMM2 images.

These data confirm the findings of our qualitative research that participants were using the cameraphones in all parts of their lives. A minority of the pictures were taken in South Hall or elsewhere on campus and featured Information School faculty and fellow students, verifying that participants did not use the cameraphones exclusively in the school setting but in all parts of their lives.

## Summary

Digital pictures, cameraphones, and online sharing have augmented or transformed many common uses of images. Multimodal communication, using image, text, speech, and other modes, is becoming increasingly available to everyone. People can choose the mode or combination of modes that are, in Kress' terms (Kress 2001), most apt for the purpose, audience, and conditions. This study has shown that, given the capability, many of our participants did engage in multi-modal communication and chose the modes and media most appropriate for conditions.

## *Conclusions*

Although our participants were largely graduate students, we believe that our results have more widespread implications. Our students are relatively mature, with an average age of 29; most are in long-term relationships and most have extensive prior work experience. They have a variety of backgrounds, including a significant number of non-technical ones. We studied more people over a longer period of time than most previous cameraphone studies. We removed two common barriers to cameraphone image sharing: technology and cost. Also, our participants were members of a relatively large, tightly-knit, pre-existing social and work network, so we could see how images would be used for communication and how practices might emerge collectively. While not all participants became frequent image-creators, many did incorporate cameraphone images into their ongoing activities.

A qualitative study like this allows us to explore the practices and meanings of images to participants in their actual, daily lives. Ito (Ito 2005a) points out the need to develop methods to perform practice-based studies that investigate private

communication practices. Our photo elicitation method, using our custom visualization, is uniquely able to do just this. We can observe and discuss with participants the automatically-collected empirical record of their image-making and sharing, allowing us to view and discuss traces of their actual practices.

We also were able to see cameraphone use stabilize as the cameraphone shifted from novelty to daily device. The time-based visualization often showed a burst of images in the first few days, with then a more consistent long-term pattern. This shows that longer-term studies in a variety of settings are essential to finding out how people adapt new technology to their higher-order, enduring activities.

## Future Directions

The results I have presented here represent the current picture I have of past and present photographic practices, and the ways new technologies are shaping these practices and practices are in turn appropriating the technologies. In particular, our MMM2 investigation hints at what future cameraphone trends could be if technical and financial boundaries to use are eliminated.

Needless to say, there is much left to explore. Even within the data we have already collected we can surely uncover new insights and patterns from additional analyses and syntheses, which I hope to continue. To start, I would like to conduct several re-codings of the data to begin to explore still more aspects of the data.

This project could be taken in many directions. We plan to conduct group interviews or field studies of photo-sharing between family members or friends. We also plan to talk more with people sharing photographs online, since there are many aspects of that space we do not yet understand. I would particularly be interested in doing a quantitative investigation of one online photo-sharing site such as Flickr or Yahoo! Photos to identify interesting patterns and follow up with qualitative investigation. We may also try to do more formalized field studies of photo-taking or diary studies to get closer to “real” use. I am also particularly interested in the role photographs play in constructed memories and in the creation of (often idealized) individual and group identities, which Chalfen discussed and others for the family snapshot of thirty years ago.

I’ve touched on the importance of recognizing that research results are grounded in a particular culture; conducting multi-cultural studies of photography usage could explore some of these differences more directly. Similarly, we could explore differences

in photographic behaviors by age, socioeconomic status, or gender, as Peter Kahn and Batya Friedman at the University of Washington are also exploring (Kahn and Friedman 2004). I would also like to explore privacy implications of digital photographs, especially as more and more photographs are posted publicly online. Finally, I would be interested in looking into perceptions of editing digital pictures and changes in “the Real” because of it.

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