The Ubiquitous Camera: An In-depth Study of Camera Phone Use

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ABSTRACT
This paper presents an in-depth study into how people use their camera phones. Using a combined method of interviews and grounded discussions around a sample of actual photos, the study examined people's intentions at the time of capture and subsequent patterns of use. The result is a 6-part taxonomy describing the way images are used both for sharing and personal use, and for affective and functional use. The implications of these findings for future products and services are discussed.

INTRODUCTION
There is no doubt that the worldwide boom in mobile phone penetration has forever changed the global technology landscape. As mobile phone operators look to capitalize further on this huge market, there are high hopes that, following on from the success of text messaging (especially in Europe and Asia), "picture messaging" using mobile phones with integrated cameras will establish photographic images as a new genre in mobile communication.

Indeed, there are some grounds for optimism. Recent statistics in Japan report camera phone sales now exceed 50% of the mobile phone market, with major operators such as J-Phone reporting over 70% of customers subscribing to MMS (Multimedia Messaging Service) [1].

However, while sales figures are good for the units themselves, it is not so clear to what extent camera phones are actually used for sending picture messages. Recent media reports [2] have described early results as disappointing. There could be many explanations for this. It may be, for example, that there are significant obstacles to use such as cost, complexity of the interface and so on. Alternatively, the value of camera phones might not lie in sending images, but in doing other things with captured images.

Unfortunately, when it comes to understanding what users actually do with their camera phones, there appears to be little in the way of in-depth data. The goal of this study was to understand how people are currently using these devices, to help steer a course for facilities that people will truly value. The study encompassed two main aims:

- *To Explore the Range and Diversity of Use.* Understanding why people capture images on camera phones, as well as the range of ways in which such images are used may broaden our outlook with regard both to the current utility of these devices and their future prospects.
- *To Elucidate the Characteristics and Context of Use.* Understanding the characteristics and context of use for different kinds of activities may suggest ways in which we could better support any particular activity.

PREVIOUS RESEARCH
Research on camera phone use is very much in its infancy. Of relevance is the literature on use of still photographic images as well as and other forms of mobile communication such as text messaging. Such areas of research are themselves relatively new although some seminal work has been done [3,4]. What is clear so far is that each of these different technological contexts has its own affordances for interaction. The extent of their relevance to camera phone use has yet to be established.

With regard to camera phones themselves, most of the existing research focuses on the sending of images, rather than the range of ways in which camera phones are used. One of the earliest such studies was "Maypole" [5]. Carried out prior to the release of commercial camera phones, Maypole provided small groups of users with prototype devices and looked at the sending behaviours of two socially connected groups of people. The study showed how participants sent images to support group cohesion, express affection, support conversation, and tell stories. Similar results were found in a study carried out by the Finnish telecommunications company Radiolinja [6].

More recently there have been several studies looking at the types and context of communication carried out via MMS. This includes the use of camera phones for work-related communication [7] and for aspects of domestic communication such as problem-solving and time management [8].

There are only a few examples of research exploring uses beyond capturing and sending images with camera phones.

Most notably, Okabe [9] has recently published an ethnographic study of the use of mobile email and image use. While this work sheds light on emerging social practices, it is not focused on design implications for new technologies.

The study we report here examines the whole range of activities that constitute camera phone usage with an eye to the design of future technologies. Further, unlike previous research on groups of individuals known to one another, we recruited a wider cross-section of individuals, most of whom were experienced camera phone users.

METHOD

This study involved the collection and examination of images captured or received by camera phone users combined with in-depth interviews conducted from May through July of 2004.

Subjects

In all, 34 subjects were recruited: 9 youths and 10 adults in the UK (mainly from the Bristol and Cambridge areas) and 4 youths and 11 adults in the US (mainly from the Bay Area). "Youths" were classified as between the ages of 16-21, while adults were classed as over 21. Both the UK and US samples aimed for equal numbers of males and females in each group but the UK sample had more males (74%) than females.

Subjects used a variety of types of camera phone and service providers, with an average total experience of 8.6 months. Most of the phones had VGA resolution cameras (640 x 480 pixels), without a zoom or flash. Only nine subjects had phones that could capture video. All but three of the subjects had access to MMS sending facilities. All but five had GPRS service enabling email access. Some additionally had infrared or Bluetooth as a means of transmitting images directly to other phones. All of the subjects had access to a PC at work, school or home.

Procedure

The study consisted of two interviews, separated by 2-5 weeks. At each interview, we asked to see five images (photos or videos) on their camera phones, which were selected as randomly as possible. We asked them to show us whatever images appeared every few clicks on the phone's image browser. Access to all the images would have been preferable but the subjects' privacy had to be respected. We did however record the number of similar images taken at the same time.

For each of the selected images, subjects were asked:

- What the image showed, where it was kept and whether it was captured or received by the subject.
- If captured, the intention behind taking the image and the context within which it was captured.
- If received, when and who sent the image, how it was sent, whether it was annotated, and conjecture as to its purpose.
- Details of any uses of the image (intended or not), including whether it was shared and how, whether it was annotated, its context of use, and intentions with regard to keeping it or deleting it.

The first interview also collected background demographic information, information about their experience with imaging technologies, and statistics about the images on their phone. The final interview also logged basic data on images sent, received and archived since the first interview, and probed for difficulties and perceived value, as well as wishes for future use of the technology.

This paper will concentrate on the main part of the analysis, which was that of the randomly chosen images. A separate report [10] gives a more detailed account of the remaining data. The analysis involved coding the data collected for each image – for example, the intentions behind images. The authors independently produced and then reached iterative agreement on what constituted sensible coding categories. The coding was done to build a framework for understanding the data rather than to prove any *a priori* hypotheses.

RESULTS

We will begin by briefly summarizing some of the demographic and background experience of the subjects before moving onto the details and findings in relation to the images we discussed.

General Camera Phone Use Statistics

Most images on subjects' phones at the time of the first interview (average 44) were ones that were captured rather than received from other people (average 2), and there were three times as many photos as videos on the nine phones with a video facility. By the time of the second interview, subjects had acquired an additional 24 photos on average. Five of the subjects with video capability had also acquired a few videos.

These statistics can be looked at in more detail by combining data from the first and second interviews to look at the whole life cycle of activity:

- *Capturing:* The average rate of photo capture between interviews was the equivalent of about 8 photos a week or 34 a month. For those with video capability, the video capture rate was much less than for photos: about 3 videos every month.
- *Receiving:* The average rate of receipt of photos was about 2 photos every month. There was negligible sending or receiving of videos between the two interviews.
- *Sharing:* Most image-sharing took place face-to-face, almost always on the phone's screen but

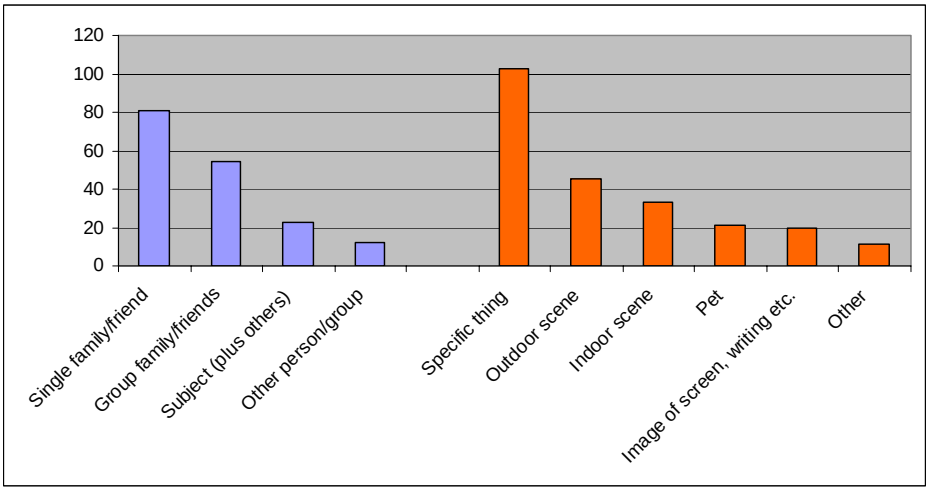


Figure 1. Number of images by category of subject depicted.

sometimes by direct phone-to-phone transfer over infrared or Bluetooth, or by MMS. To send images to remote users, 22 subjects reported that they used MMS and 12 reported use of phone-based email. The average rate of sending photos direct from the camera phone during the study was equivalent to about 6 per month (after discounting one outlier subject). In addition, 12 subjects reported that they would sometimes send their photos via their PC because they were unable to use the sending services, or the recipient did not have a capable phone.

- *Printing:* Only 12 subjects reported that they printed photos captured or received on the phone, and most said they did so only a few times a year.
- *Archiving:* The average rate of archiving between the two interviews was about 15 photos per month (there was negligible video archiving).

Description of Examined Images

In total, across all subjects and interviews, we collected data on 303 photos and 17 videos. Of these, less than 8% were images that were received.

The images depicted a range of subjects. Figure 1 shows the frequencies of what was captured by content, although sometimes two types of content occurred in a single image. The most frequent were images of people, comprising 51% of the total. Of the images containing subjects other than people, the most frequent were the 32% of images that contained a specific thing, e.g. a rare book, a car, flowers, a shopping item, food eaten, or a building.

While the content of these images reveals something about what the subjects tended to capture, it is the stories behind these pictures – why they were taken and how they were used – which provides the real insights into the value of camera phones.

A Taxonomy of Reasons for Capture

This section looks at the reasons *why* subjects captured images (photos and videos) with their camera phones. It focuses on captured rather than received images, which represent the majority.

There were broadly two different dimensions along which subjects' intentions varied. The first was whether images were taken for "affective" versus "functional" reasons. Affective images are those captured for some sentimental or emotional reason, such as joking or showing affection for someone else, or to evoke an emotional reaction in oneself. Functional images were those taken to support a particular task and thus were more practical in nature.

The second dimension was that of "social" versus "individual" intentions. Social intentions were those where subjects reported capturing images to enhance or support sharing with other people. These can be broken down into sharing with people who were co-present and sharing an experience related to the image, versus sharing with people who were not co-present at the time of capture. Individual intentions were those in which subjects captured images for personal use.

This breakdown results in the six intention categories shown in Table 1 along with the frequency of images falling into each category. Of the 295 captured images, 22% had more than one intention reported.

The six different categories in Table 1 are now examined in more detail.

Affective Categories

Mutual Experience

The most common social reason for capturing an image was to enrich a mutual experience by sharing an image with those who were co-present at the time. Many such images were centered on people. Many were taken at social

	Social				Individual	
Affective	**Mutual Experience.** Images intended to enrich a shared, co-present experience (either in the moment or later as a memento).	103 (35%)	**Absent Friends or Family.** Images intended for communication with absent friends or family (either in the moment or later).	63 (21%)	**Personal Reflection.** Images intended for personal reflection or reminiscing.	120 (41%)
Functional	**Mutual Task.** Images intended to share with people co-present in support of a task (either in the moment or after the event).	11 (4%)	**Remote Task.** Images intended to support a task by sharing with remote family, friends or colleagues (either in the moment or later).	23 (8%)	**Personal Task**. Images intended to support some future task not involving sharing.	29 (10%)

Table 1. A taxonomy of image capture, with numbers and proportions of images by category.

gatherings, parties or events, often in public venues like pubs and restaurants, and sometimes on trips or outings with others.

Sharing a mutual experience was done in essentially two ways: either by enhancing the shared moment, or by sharing an image later as a memento of something experienced together. The majority of images fell into the former category (59%), where taking a picture and sharing it immediately with others was a way of enhancing a social occasion, marking an event, or showing the value placed on an experience. Sometimes the picture-taking was almost a social end in itself. One younger subject remarked: "We were swapping phones and taking pictures of one another – using one another's phones as well." But mostly the images were about a specific occasion. The motives ranged from joking and gentle provocation to a more straightforward celebration of being together. For example, the image in Figure 2(a) shows one young subject's friend engaged in making a parachute out of a plastic bag. The subject jokingly took the photo as a way, she reported, of "embarrassing her childish friend".

The other main intention, to share images as mementos, describes almost half (48%) of the instances in this category. For example, Figure 2(b) shows a memento of a "hen night", a traditional party given for a bride-to-be (the "hen") by her female social circle. It was taken to show the hen herself, who is in the centre of the picture. Another subject took a picture of his wife and mother together on a trip, and later emailed the image to them. Many other images of family and friends were captured to be shared with the people present at a later time.

The reality of how images in this overall category were actually used was not straightforward. Most were shared; however, the most common way was sharing in the moment on the phone itself. Subjects reported only one instance of sharing by sending from the phone to others co-present at the time of the event.

Further, sending after the fact, even if intended, had often not occurred by the time we interviewed subjects. Many said they simply had not "gotten around to it yet". The implication here was that the time and effort one must put into sending these "gifts" was difficult or inappropriate to achieve in the moment, and it may be that people simply lose the impulse to share later.

Finally, there was a strong expressed desire to be able to keep images in this category long term – about a third indefinitely on the phone, and about half of them longer term on a PC or (occasionally) the web. Unsatisfactory image quality often arose as a problem in this respect, undermining the desire to archive or print these images as mementos.

Absent Friends or Family

Images in this category differed from the previous category in that the intention was to share or communicate an experience with *absent* people. Again, this could happen "in the moment" in that there was a desire to share an event as it unfolded, or it could happen after the fact. Images in this category were predominantly of specific things (60%) with some shared meaning for the absent person, followed by people figuring in 36% of the images.

Figure 2(c) shows an example of extending an experience to absent friends: the subject was at a music festival which she shared in the moment by sending an MMS image of her muddy boots. The next two examples go further in being more about the relationship between the people involved and less about the sharing of a particular experience. The arrival of the box (Figure 2(d)) was communicated in an MMS message as a way of teasing the recipient, who desired the audio equipment that it contained. Figure 2(e)

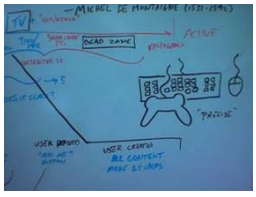
Mutual Experience	(a)  (b) 
Absent Friends or Family	(c)  (d)  (e) 
Personal reflection	(f)  (g) 
Mutual Task	(h)  (i) 
Remote Task	(j)  (k)  (l)  (m) 
Personal Task	(n)  (o) 

Figure 2. Images by intention category. **Mutual Experience**: images taken for teasing (a) and as a memento of a "hen night" (b). **Absent Friends or Family**: sharing muddy conditions at Glastonbury festival (c), teasing about a desired object (d) and riddling (e). **Personal Reflection**: images showing personal aspiration (f) and signifying a personal achievement in having entered a subway station despite earlier panic attacks (g). **Mutual Task**: images showing a plumbing problem to be solved jointly (h) and a meeting to be recorded in minutes on the web (i). **Remote Task**: reminding about goldfish to be fed (j), a haircut to take to the hairdresser (k); a candidate style of material for a wedding (l); evidence about the dog being looked after (m). **Personal Task**: a gift idea (n) and writing on a whiteboard (o).

shows a riddle that one subject constructed to send to her husband, concerning the gift for him that had just arrived.

Many of the images in this category not only made use of shared meaning of objects but also drew value from the contemporaneous connection that was possible through the

camera phone. Drawing someone into an experience in real time despite being separated by distance represented a compelling way to stay close. As one subject put it: "This was a telepresence - she could feel like she [his girlfriend] is here to see it." In all, 27% of the images in this category were shared in this way.

Not only did many such images demonstrate shared history between friends or family, but they were also sometimes more tightly woven into an ongoing conversational context using a range of technologies. Again, real-time interactions were part of this. For example, one subject went out to take a picture of his new car in immediate response to receiving a friend's picture of his new motorcycle; the pair then had a discussion by phone. There were also several cases of users sending picture messages while communicating by email and instant messaging.

In addition to sharing in the moment, many images in this category were later either shared on the phone itself (38%) or sent (16%). Most were sent directly from the phone but a few were sent by email on a PC, via a web page or as a print-out in a letter. This *post hoc* sharing typically involved story-telling with friends and family who had been absent.

Like the previous category, about a quarter of the images were never shared with absent friends and family, despite the initial intention. That was sometimes because the original impulse to share had been lost, but was also because of problems in terms of poor quality of the image. Although only a sixth of these images were intended to be kept long-term on the phone, subjects expressed a desire to keep about half of their captured images in this category long-term on a PC.

Personal Reflection

This category, the largest of the six, encompasses those images captured for the purpose of individual reflection or reminiscing.

Subjects' comments indicated that portability and the ability to capture and carry images was important. As one person put it: "It's nice to capture a little moment to carry with you. It's a memento." Such images were thus used like digital "flipbooks" of favourite images, or the images one might keep in a wallet. Many were carried in order to keep some treasured person or object "close", including family (e.g., babies), friends, or pets, and pictures of gifts of emotional or sentimental value. Other images had more personal meaning. One woman carried around a photo of the house she aspired to own (Figure 2(f)), and a man captured a sign at a subway station which signified his having overcome his panic attacks. Previously, these would have affected him where he was standing when he took the picture (Figure 2(g)).

While such images were intended for personal reflection, in fact two thirds of the images were shared. In most cases (56% of images in this category), this was through showing to others on the phone, mostly after the fact and opportunistically. In addition, 24% of the images were also sent from the phone or via a PC.

Similarly to the Mutual Experience category, subjects reported that they intended to keep about a third of the images on the phone indefinitely, and save about half of the images on a PC. There were about 10 cases of using images for phone "wallpaper" or for associating with friends or family in their contact lists.

Functional Purposes

Mutual Task

This, the first of the functional categories, was of images captured to complete a task with people who were co-present at the time of capture. This was a small category, comprising just 11 images. Further, half of the images in this category were involved only in a relatively trivial form of "task" where subjects were demonstrating or experimenting with their camera phone's functionality.

However, other images were used in more substantial tasks. Some served as a shared record required to discuss something that needed doing, or to capture its state before work began. For example, a couple took a picture of pipes in discussing a plumbing task, which they later also took to a store (Figure 2(h)). A rather different case was where a man took a picture as a record of a museum event, which he later integrated into the minutes of the event, sharing with others who were present (Figure 2(i)). While there are too few examples to draw general conclusions about this class of images, they demonstrate ways in which records of shared experiences can usefully form part of various tasks.

Remote Task

In this category, images were taken as part of a task shared with people who were *absent* at the time of capture. Again, this was a relatively small category. However, it contained interesting examples of supporting tasks.

Most (77%) of the images were of a specific thing connected with the task. Often such an image was used to tell or remind a remote person about something that needed doing, or discuss it with them. The goldfish in Figure 2(j) was accompanied by the text annotation "feed me"; the subject wanted to remind his daughter to feed the fish while he was away. Figure 2(k) was captured as a sample of a haircut that the subject took with her to the hairdresser. The man who found the jacket in Figure 2(l) sent the image straightaway to a husband-to-be, recommending that he should visit the shop to consider attire for the wedding. Another sub-category of these images were used as evidence needed to meet a commitment with an absent person. Figure 2(m) shows the healthy state of a dog that the subject was looking after while its owners were away. Another subject assured his mother he had landed safely, with a picture of the plane being disembarked.

The above examples demonstrate the importance of timeliness. Sometimes images were more effective shared "in the moment" (such as the photo of disembarking the plane), or at least within some short time window (such as the happy dog). Others were used to capture information to use later, either to share face to face with someone else (the haircut), or to be used by someone remote (the jacket). The importance of time is reflected in the fact that about half of these images were sent rather than shown later to others.

Personal Task

This, the largest of the functional categories, covers a range of reasons why people took images to support some practical, individual task. About two thirds of these images were of specific things involved in a task.

Many of the images in this category were used to record information for later reference. For example, one woman captured gift ideas while in shops (Figure 2(n)). A man took an image of a whiteboard (Figure 2(o)) to remind himself of comments in a meeting. Detail was sometimes quite important, such as a car registration number one person captured after an accident. Finally, images as a reference source were sometimes collections: one man took pictures of objects in scrapyards to use in thinking about future sculptures he might make.

Aside from images being used for reference, other functional uses included personal reminders (e.g., one youth took a picture of his friend to remind himself later that he needed to send him a message).

As with the previous categories, most of the images in this category were kept short-term on the phone, mainly until they had served their purpose.

Age, Geography and Gender

While it was not a primary goal of this study to examine demographic differences, we did test for statistical differences for many of our key measures across age (youth versus adult), geography (US versus UK) and gender. There were only two differences of statistical significance overall. First, we found a greater proportion of images in the "Mutual Experience" category for youths than for adults ($p=0.027$). That is, youths used their camera phones more than adults in connection with experiences they shared with other people. Second, males captured significantly more images than females in the "personal task" category of intent ($p=0.014$).

DISCUSSION

This study has found that camera phones support more diverse activities than previous data might suggest, and in a wide variety of contexts: some social and some not; some with emotional aspects and others of a practical nature.

Nature of Sharing

There was little evidence of a strong "capture and send" culture among the subjects of the study. Sending rates were considerably lower than capture rates; indeed, less than 8% of the images on the subjects' phones had been sent to them by other people.

However, the study data showed that two thirds of the images examined were captured to share, mainly for affective rather than functional reasons. The majority of image-sharing (one third of all images) took place face-to-face on the phone itself, often "in the moment", but also frequently after the fact in social situations. This kind of sharing was often "fluid" – casual and spontaneous, sometimes going beyond the original capturing intention. For example, sharing involved impromptu storytelling, passing the phone to someone else, or swapping phones with a friend. Indeed, being always to hand was mentioned as the main thing that the subjects liked about their camera phones.

Barriers to Sending

Only about one fifth of the images were shared by sending directly from phone to phone (largely via MMS). The data suggest a number of reasons why sending was not more frequent, including expense, complexity and the poor quality of the image.

In addition, the lack of a "critical mass" of people to exchange images with was a barrier. The subjects in our study said they knew on average about 8 people who had camera phones. However, they reported that they sent images to only 2.5 people on average, and received images from only 1.9 people on average.

New Forms of Interaction

The categories of use reported above suggest that camera phones enable new forms of interaction, and are not simply extensions of already existing devices such as mobile phones or digital cameras.

Communicating with Images

The combination of camera with direct sending capabilities provides the ability to bring remote people into an experience or to accomplish tasks with them, through the use of images. Despite the barriers to sending, when such activities were achieved they were compelling examples of new forms of communication.

These activities are distinct in several ways from related messaging activities. Unlike text messaging, many images sent to absent friends and family were visual evidence of something having had occurred. Many such messages were sent with no or little need for further explanation; they made sense because of shared context and understanding, and depended on and symbolized the closeness of a relationship. Such cryptic images (to the outside observer) include many playful images, visual riddles and shared jokes. Unlike emailed images, they could be captured and shared in the moment, adding an extra dimension to remote sharing by showing *when* something was happening as well as *what* was happening.

A new form of communication was also demonstrated by the spontaneous capture of visual information to help in achieving a task, such as showing what the fabric for a jacket looks like. Where the information is fundamentally visual in nature, neither text nor voice will suffice. Such information can be emailed or sent in other ways, but the spontaneity of capture allows users to take advantage of opportunities more flexibly. In addition, sending information to a phone rather than an email account viewed on a PC connects with a person regardless of their location. The father who sent the reminder about feeding the fish was choosing a device that the daughter would always have with her, rather than relying on her visits to the PC.

Always to Hand

The ability to capture anywhere and view anywhere meant that camera phones were often used as personal "flipbooks" of images. The fact that they could be kept close was important for personal reflection – as well as facilitating sharing, as noted above. Indeed, subjects stated a wish to keep 27% of their images with them on the phone long term, with the highest proportions in the more reflective categories. This augmented what is already known about mobile phones in general – that many people feel a strong emotional attachment to them [11].

Capturing and viewing anywhere also supported more task-related functions. This included capturing evidence of an event having occurred, capturing images of physical objects or documents related to an event, and capturing images as personal reminders to do something in the future.

Finally, compared to conventional digital or film cameras, the camera phone was used about half as often in places where people typically do not have such cameras – work/school, social venues such as pubs and restaurants, and when "out and about". Moreover, there was a sub-genre of images depicting unconventional subjects, which were taken spontaneously for reasons such as amusement, experimentation or curiosity.

IMPLICATIONS

The above findings have implications for the future of camera phone technology. Image quality, which was an issue for many uses, needs to improve and will do so as a matter of course. But this research suggests that deeper changes are needed.

The overriding implication is that designers need to recognize the diversity of activity that camera phones support, encompassing functional as well as affective activities, and individual as well as social activities. In other words, their use is much more complex and rich than any simple model of camera phone use would assume. Designers need to understand these activities in order to support them, and the need to move between them.

Capturing and sending, in particular, has the promise of a new and compelling genre of communication which, at this point, is fraught with problems. There are obvious implications to deal with barriers to use including the elimination of technical complexity, lowering cost barriers, and improving image quality.

Each of the other ways in which camera phones are used is worth considering as a valuable activity in its own right. For example:

- *Easier Showing in the Moment.* A key value observed for camera phones was that of spontaneously showing images. This suggests that finding and browsing images needs to be as simple as possible; currently, users mostly organize their images only chronologically, and stepping through to find an image is relatively slow on the phones we saw. The quality and size of the screen are also important, although their trade-off against cost and portability is problematic, suggesting that connecting with *in situ* displays is an interesting alternative approach. The iPod Photo [12] is designed to support rapid browsing and searching through large numbers of images, and to enable the images to be shared by viewing them on a TV over a cable. Pervasive computing research has much to offer here in terms of approaches to interacting *wirelessly* with environmental displays, including the privacy aspects of doing so when the displays are public [13].
- *Easier Giving in the Moment.* The subjects often wanted to give photos to those who were present at an event; indeed, the data suggest that the impulse to share is greatest at the time of capture. The implication is not only that beaming images to single recipients be as simple as possible, but that one might also want to broadcast an image to a number of people in the same space, for example at a party or work meeting.
- *Better Ability to Connect in the Moment.* The examples of interweaving images into larger conversational contexts suggest that there may be the opportunity for applications that allow, for example, ongoing talking or messaging while viewing images, all on the camera phone. As it currently stands, the people in our studies had to use multiple devices to accomplish this activity.
- *Better Tools for Mementos and Records.* The study showed that camera phone images can be effective mementos and records, both personal and shared. But even the best images capture a situation only partially, and other aspects may escape later recall or remain hidden to people who were absent. The subjects responded positively to the idea that a camera phone could automatically capture more information about the context and link it to the image, including who was present, where the

image was captured, the sound, and even incidental parts of the context such as the weather.

- *Better Tools for Deleting and Archiving.* Subjects mentioned a desire to keep about half their images long term on the PC, particularly images in the affective categories. At the same time, users tended to have many images on their phones that they would delete if they had time, and whose presence can make the phone less useful as a "flipbook". This points to the need for quicker and easier tools to help people sift through and delete or archive camera phone images, in potentially large numbers.

CONCLUSIONS

The study shows that the camera phone is neither an incremental step forward from a mobile phone, nor a poor relation of a digital camera. Rather, it is a device which is sometimes used rather like a digital camera, but is different in the range of activities it supports. This work has shown the use of the camera phone in its many guises, from ever-present photo "flipbook" for sharing or reflection, to a means of communicating in the moment with absent friends and family, to its use in task management and the accomplishment of remote and shared tasks. It excels in particular where sharing is fluid and spontaneous, such as showing images in social situations. Despite many barriers to use, the ability to send images for a range of reasons remains compelling. This paper has not only highlighted the potential of this new technology, but also has suggested new directions which will encourage and support the full range of activities that the data suggest.

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