

Collaborating around Collections: Informing the Continued Development of Photoware

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ABSTRACT

This paper explores the embodied interactional ways in which people naturally collaborate around and share collections of photographs. We employ ethnographic studies of paper-based photograph use to consider requirements for distributed collaboration around digital photographs. Distributed sharing is currently limited to the ‘passing on’ of photographs to others, by email, webpages, or mobile phones. To move beyond this, a fundamental challenge for photoware consists of developing support for the practical achievement of sharing ‘at a distance’. Specifically, this entails augmenting the natural production of accounts or ‘photo-talk’ to support the distributed achievement of sharing.

Categories and Subject Descriptors

H.2.8 [Information Systems] Database Applications – *image databases*; H.5.3 [Information Systems] Group and Organization Interfaces – *collaborative computing*

General Terms

Design, Human Factors

Keywords

Ethnography, photographs, photo-talk, distributed collaboration.

1. INTRODUCTION

CSCW researchers have recently turned their attention towards the work involved in collaborating around collections of artefacts in an effort to explore ways in which everyday experiences may be augmented and enhanced by computer support [17, 18]. This paper exploits ethnographic study [5] to investigate the work involved in collaborating around collections of photographs. Specifically, it offers a preliminary exploration of the *embodied interactional* ways in which people naturally collaborate around collections of paper-based photographs in their homes [12]. Initial findings highlight situated arrangements of collaboration and essential interactional practices whereby users make photographs

meaningful objects in their conversations and so come to share them.

These findings have implications for the development of computer support. While existing interfaces appear to provide for face-to-face collaboration, it is less clear how existing technology might support collaboration in a distributed fashion. Distributed collaboration is currently restricted to passing photos on, by email, webpages, or mobile phone. Consequently, our studies suggest that a fundamental challenge facing the continued development of photoware consists of the development of interaction techniques that enable geographically dispersed users to share photographs at existing interfaces and in ways that resonate with natural practices of collaboration.

Digital photography is a commonplace feature of everyday life. CSCW researchers suggest, however, that existing photoware applications constrain the “communication of experience”, which is taken to be the *raison d’être* of photo sharing [13]. Recent interface developments [1, 27] may go some way to resolve this problem, supporting sharing (particularly manipulation and tangibility) through novel interface design. While providing support for face-to-face sharing, innovations at the interface provide no support for distributed sharing however, as underlying dataspace effectively stand alone. Users may well be able to ‘communicate experiences’ through new interfaces then, but only insofar as they are co-located.

This paper seeks to inform the continued development of photoware. Its particular contribution is to draw out and highlight some of the serious challenges involved in devising computer support for distributed sharing. To do this we consider some salient features to emerge from ethnographic studies of the collaborative use of photographs in the home environment. The studies were undertaken in May 2001 across 22 family homes in the UK as part of a broader and ongoing research initiative to investigate the social organization of technology and media use in the home. Findings have been employed to inform the placement and development of ubiquitous computing [9, 11, 25], the development of personal information management tools [7, 8], and to inform the development of communication technologies for home use [6, 10]. We concentrate on photographs here due to the potential relevance of distributed photoware to home users. Simply put, photograph use was a common feature of our home studies and the development of photoware that supports distributed sharing strikes us, as it does others [13], as a significant area of technological development for the home.

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2. THE CURRENT STATE OF THE ART

Work to date has seen support for collaboration with digital photographs configured in one of two basic ways. On the one hand, digital photographs have been construed of as objects which need to be organized for retrieval, browsing, and viewing [20, 24]. Such technologies configure collaboration so that it takes place around a single screen, such as a desktop PC interface, and where digital photographs were used by the participants in our home studies, the traditional PC interface was indeed the initial point of contact. We say ‘initial point of contact’ because, as Frohlich et al. [13] also observed, users often printed digital photographs off in order to *share* them.



Figure 1. Traditional configuration of collaboration

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This behaviour points to the constraints of the traditional interface, which has been recognised by researchers in the field:

... almost all research in how to support experience sharing with digital data suffers from the limitations of current display technology. [27]

Shen et al. (ibid.) suggest that the traditional interface is not well-suited to support collaboration because it forces people to face in the direction of the screen and that its design assumes that people will always be viewing objects from roughly the same direction and angle. It is noted, however, that the assumptions and physical constraints of the traditional interface are incompatible with paper-based photograph use, where collaboration is characterized by various bodily orientations of users to photographs. These orientations are not incidental to use but essential insofar as one wishes to support real-time sharing.



Figure 2. Circular tabletop interface [27]

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Recognition of the importance of physical orientation has led to the development of circular tabletop interfaces (as in Figure 2) that enable users to push photographs around the table and orient them to one another in the course of their collaborations [31]. While such interfaces permit sharing amongst a group, it is not at all clear how they support sharing amongst individual group members, however.

Complementing the emphasis placed on physical orientation is that placed on photographs as objects that trigger storytelling:

One of the most common ... uses for photographs is to share stories about experiences, travels, friends and family. Almost everyone has experience with this form of storytelling, which ranges from the exchange of personal reminiscences to family and cultural histories ... For example, all of us have had the experience of handing around a photo album while the photographer tells us the story behind the pictures. [1]

Storytelling is an essential, intimate and non-trivial feature of photograph use – it is the vehicle by which people communicate experiences - and this recognition has resulted in a different configuration of collaboration where interaction takes place around portable devices (ibid.) and, more recently, around mobile phones [21].



Figure 3. Interacting via portables [1] (Ricoh Innovations, Inc.) © 2000 ACM Inc., included here by permission.

These configurations are highly flexible and allow the fluid orientation of people to photographs. They are not without their own problems, however. The small size of the devices limits group interaction and highlights the need to make such devices interoperable with new forms of interaction that support the real-time demands of collaboration (ibid.).

Frohlich et al. [13] are explicitly concerned to develop design sensitivity to the real-time demands of collaboration. This research moves beyond considering current photoware products to consider paper-based photography as well, in order to elaborate “existing practices of conventional photo sharing and make recommendations for future photoware” (ibid.). By examining what users currently *do* with paper-based photographs, Frohlich et al. seek elaborate what users might actually want from photoware in the future?

In order to develop answers to this research question, Frohlich et al. set out to examine “photo-talk” – i.e., naturally occurring conversations in which photograph sharing takes place. While we are sympathetic to the rationale driving this research, and

its aims and objectives, it is interesting to note that Conversation Analysis [26] was rejected as a primary means of inspecting photo-talk, insofar as the approach was perceived to focus on the social organization of talk at the expense of examining the organized use of artefacts over the course of conversation. Consequently, the researchers elected to explore the research question through ethnographic methods, including home tours where participants were asked to describe how they organized and shared photographs, and self-recording techniques where participants were asked to record photo-sharing conversations on audio tape and log details of those events in a diary.

These studies found that participant's frequently share photographs with family and friends, both co-presently, in face-to-face interaction, and by sending them via the post and subsequently discussing them over the phone. Where the use of digital photographs is concerned the study reported that participants were "turned off" by looking at digital photographs on a computer screen when sharing with family and friends because they lacked the tangibility and manipulability of physical photographs and so constrain the communication of experience. Frohlich et al. suggest that to remedy the situation there is a need to develop further insights into the collaborative nature of "image-based communication practices" to inform the development of computer support for the co-located *and* distributed sharing of digital photographs.

3. ELABORATING PHOTO-TALK

Our studies seek to complement Frohlich et al's. research [13] by elaborating existing image-based communication practices involved in the sharing of paper-based photographs to inform the development future photoware. To do this, we seek to inspect photograph sharing directly, as it is observably and reportably *done* moment-by-moment in real-time in details of embodied interaction. In this section we briefly articulate our approach to the study of photo-talk and collaboration around collections more generally and the section is followed by close examination of two empirical instances of photo sharing. The approach we articulate is not offered as an alternative to or critique of the methods employed by Frohlich et al., but as something that might be added to the study toolkit to complement existing methods and broaden the study focus.

Broadly speaking our studies are ethnographic. That is to say that they were conducted through the immersion of a researcher in a variety of domestic settings who, after careful observation, assembled a documentary portrait of ordinary day-to-day activities that take place there before standing back to make a more detached assessment or analysis [22]. It is worth noting that doing ethnography in domestic settings is not, as it might be presumed, any more difficult than doing ethnography in the workplace. From the point of view of conducting a study, the home is no more private a place than work settings, indeed there are far few gatekeepers to address in the home and obtaining access is considerably easier.¹ It is also worth noting that ethnography is a not a mode of analysis, but rather, a method of gathering data (which in this case consisted of making video recordings of people collaborating around collections of photographs). How one analyses the data is an open matter then.

¹ For a fuller discussion of these and other related issues see [11].

Many researchers employ generic representational formats such as Conversation Analysis or Interaction Analysis to identify organizing features in the data. An alternate approach is offered by ethnomethodology [15, 4], which suspends the use of representational formats and places emphasis instead upon the careful description of the situated practices whereby the action recorded on the tape is observably organized by participants. This approach – suspending the use of *a priori* formats to examine the data in terms of its situated production and *in vivo* organization – has exercised some considerable purchase in CSCW following the pioneering work of Lucy Suchman [29] and it is employed here to analyse the collaborative use of photographs.

In the following section we present two vignettes, which elaborate salient features to emerge from our studies. The vignettes were not all that came out of our studies; we gathered a great deal more data than that. They are employed for the reason that they illuminate important collaborative features of photo sharing. It should also be appreciated that our studies are not intended to be representative in a numerical sense of the word. We set a concern with frequency counts and other quantitative measures to one side, focusing instead on empirical instances of photograph use in unfolding details of their actual occurrence in order that we might see what can be seen, and learn what can be learnt, of photograph use as a collaboratively organized activity in real-time. Accordingly, we analyse and account for collaboration in terms of real-world sequences of participants' talk *and* practical actions. By examining *interactionally embodied photo-talk* we hope to avoid the pitfalls that have been attributed to Conversation Analysis, examining talk-and-bodily-action and so bringing into consideration the social organization of artefacts-in-use [3].

4. INTERACTIONALLY-EMBODIED PHOTO-TALK

The following vignettes were gathered from family homes in the Northwest of England (UK). The first vignette involves two adult males (Billy and Andy), two adult females (Lou and Suzy), and two young children (Lydia and Sam). The second vignette involves two adult females (Heather and Rachel) and one adult male (Jack). Both occasions of photo sharing focus on the use of stored rather than displayed photographs, which is to say that use of photographs that are on permanent display in the home are not considered here as their use was not a feature of interaction in our studies, and both are prefaced by the retrieval of photographs from specific locations in the home: from drawers and cupboards where photos are kept in the respective homes and from where they are ready to hand. It is notable that various material arrangements provided for the use of photos. Photographs were kept in boxes, folders, bags, and albums according to the significance of collections. For example, photographs of a family wedding were kept in a simple but ornate box in one household. Photos of the householder's own wedding were kept in specially made album. Photographs of the householder's children were kept in another album and an ongoing project, assembling a photographic family tree, was kept in a folder containing plastic wallets inside a plastic shopping bag underneath a cupboard where it was ready to hand. Mundane as these observations are, they represent widespread, everyday practices for organizing and managing photo collections and preparing them for occasions of use.

4.1 Situated Arrangements of Sharing

Andy and Suzy are visiting Billy, Lou and the kids. They are all family members and following dinner Lou gets some photographs out that she has recently been sorting through. Lou is working her way through a pile of loose photographs (i.e., photos not in an album), telling stories as she goes along:

1. Dave: Is that your Granddad?
2. Lou: *Points to the photo on top of those in her hand.* That's my Granddad, who was a real character.
3. Lou: You remember Great Granddad don't you Sam?
4. Sam: Yup. *Sam takes the photo off Lou.*
5. Dave: Let's have a look.
6. Sam: *Orients the photo to Suzy, who he is sat next to.*



7. Dave: Let's have a look.
8. Sam: *Orients the photo to Suzy, who he is sat next to.* See, we're at my house.
9. Suzy: Yeah.
10. Sam: *Puts the photo with the others that have been looked at on the floor.*
11. Lou: *Picks the photo up -* That's Granddad there - *and gives it to Dave.*
12. Lou: *Looks at the next photo in her hand.* And that's Granddad there.
13. Sam: *Takes the photo off Lou and shows it to Suzy.*
14. Lou: Granddad lived just long enough to know that Lydia was born; he died about three days after.
15. Suzy: Ahhh.
16. Dave: *Holds the photo out in front of Lou.* How old was he there then? (Figure 5)



17. Lou: *Takes hold of the photo as well.* Ninety, ninety-one.
18. Dave: Were he!
19. Lou: Yeah.
20. Dave: Fit bloke.
21. Lou: Yeah.
22. Dave: *Gives the photo back to Lou.*
23. Lou: He lived a good life.
24. Dave: Yeah.
25. Lou: He really did. *Puts photo with others on the floor.*
26. Sam: *Walks over to Dave holding two photographs up.*



27. Dave: Hey-up, what's these two.
28. Sam: These two?
29. Dave: *Looks at one of the photos.* Oh that's your Granddad.
30. Sam: These are two that you didn't see.
31. Lou: *Continues working through the photos in her hand.*

4.1.1 Emergent Features

The vignette displays a very common and recognizable collaborative use of photographs that "almost everyone has experience with" [1]. While the use of photographs to tell stories is a very familiar and widely recognized phenomenon, what is striking about the vignette are the situated arrangements of collaborative sharing it makes visible. In details of the participants' talk and practical actions, the vignette displays the collaborative practices involved in image-based communication by the members of small groups or gatherings more generally.

It can be seen, for example, how 'sharing' is an *achieved* feature of collaboration where the use of photographs is initially coordinated by the participants from some contingent central point {utterances 1 – 9}. That 'point' may be a table, a sofa, or on the floor, as in this case. Whatever the case, the arrangement provides a mutually accessible location for persons to gather around and view photographs. This location allows the use of photographs to be locally managed (distributing photographs among participants and placing those that have been looked at in discrete places, for example).

What we have here, then, is a *control centre* of sorts. Here the members of the group orient themselves to the party who holds and controls access to the collection of photographs. The photographs in hand are not only resources for the holder to tell stories and convey experiences, but are conversational resources for the other participants as well. On seeing the

photographs in hand participants may ask questions of the holder and in other ways raise conversational topics that may subsequently be worked up through the telling of a story. Having a flexible group view of photographs is therefore important where the collaborative use of photographs is concerned.

It can also be seen that *personal views* are important to the collaborative use of photographs. Topics may be pursued by particular members of the group, rather than by the group as a whole {utterances 1, 5 and 10, 15-24, 26-39}. Interaction is marked here by the passing on of a photograph for personal viewing by a participant. Personal viewing of the photograph may trigger further conversational topics and the group subdivides as particular members orient to the particular photograph in hand. This arrangement of collaboration allows persons to explore topics of interest without implicating the whole group. It is marked by the movement of photographs from the control centre to *outlying positions* which permit personal viewing and from where they may be shared with, and passed onto, others who are interested in the topic to hand.

It is available to observation that the sharing of photographs consists of the telling of multiple stories which run alongside each other at the same time; utterances {10-12} provide an example. Multiple sub-divisions of the group may occur and run *simultaneously* then, with each arrangement of collaboration allowing persons to explore topics of interest without implicating the whole group and otherwise allows interaction to proceed without interruption (such as waiting for someone to return a photograph to the control centre). It is striking too that such interaction is not chaotic. Rather, it proceeds smoothly in an orderly fashion and in an orderly fashion, with the return of photographs to the control centre, divisions are smoothly coordinated to pull the sub-groups back together {utterances 21-24}.

4.2 Sharing and Gesturing

Heather has been assembling a photographic family tree and she is showing her progress to date to family members Jack and Rachel. Some of the photographs have been catalogued in folders; others are new and have yet to be ordered in a formal way.

1. Jack: Who's that man you've just showed me?
2. Heather: *Flips back to the last photo and points at a person.* That one?
3. Jack: Yeah.
4. Heather: *Taps picture of person.* Him?
5. Jack: Yeah. Who is it?
6. Heather: Granddad Quine. This - *points at two people on loose photograph* - is their golden wedding [i.e., Granddad Quine and his wife].



7. Jack: Ah, right, got you.
8. Heather: Right, and you've got Auntie Maggie. *Points to person on photograph.*



9. Heather: And Grandma. *Points to person on photograph.*



10. Jack: Uh-uh.
11. Heather: And Evelyn. *Points to person on photograph.*
12. Heather: And Maggie's husband, Uncle Sam. *Points to person on photograph.*
13. Heather: Grandpa. *Points to person on photograph.*
14. Heather: And us [i.e., herself and her husband]. *Points to two people and taps on each.*



15. Heather: And that's just shortly after we got married.
16. *Points to a photograph to the left.*



17. Jack: Uh-uh.
 18. Heather: And it's their [the Quine's] golden wedding. *Points to photograph on right.*
 19. Jack: Yeah.
 20. Heather: That's nice to have.
 21. Rachel: Hmm.

4.2.1 Emergent Features

Regardless of the particular nature of interaction (that it is about a specific family tree), this vignette shows a common use of photographs that recent development work has set out to support, namely the authoring of stories through the *ad hoc* assembly of photographs from various collections [1]. This is an important area of support as it recognizes the *recipient designed* nature of photo sharing [26]. Stories are not simply constructed and told wholesale and by rote to whomever, but their telling is occasioned and designed *in situ* for the particular people who are party to the use of the photographs. As parties to the occasion change, then so too do the stories told. Close examination of the *ad hoc* and recipient designed assembly of stories illuminates an essential feature of the collaborative use of photographs that needs to be taken into account when design moves beyond face-to-face collaboration to consider supporting the distributed sharing of photographs or sharing 'at a distance'.

Distributed support represents the "biggest gap in the photoware market" at the present time [13] and currently refers to little more than the passing on of photographs to others, whether via email, web pages, or mobile phones, all of which provide inadequate support for image-based communication practices providing for the recipient design of photo-talk. As the vignette shows, it is through recipient design that stories come to be told, that photographs come to assume their particular 'sense and reference' – i.e., their meaning for conversationalists - on the occasions of their use, and that photographs thereby come to be shared. We wish to open up the design space and move beyond a concern with passing photographs on to consider the active, distributed, sharing of photographs where, for example, one party is located in Dallas and another in New York, and where storytelling between the two parties is mediated by digital forms of interaction rather than or in addition to the telephone.

With the emergence of picture messaging, this is not an unreasonable proposition. Despite the hype, however, it is not achievable as yet. Recent work in the field highlights the limitations of distributed sharing. The Maypole project [21] shows, for example, how digital photographs often require the addition of text for their sense and reference. Here, then, sense and reference is mediated through text, which may be seen as a

proxy for conversation. The vignette highlights other image-based communicative practices of mediation whereby photographs come to assume their occasioned sense and reference however; practices which pose significant challenges for the distributed sharing of digital photographs.

As Balobanovi et al. [1] note, and then pass by, "people point at pictures when talking about them". We would suggest that people do not simply point at pictures when talking about them - when they point they are *doing* something. What are they doing? Utterances {1-6} show, for example, how pointing is done to establish a *mutual* sense of the topic of conversation, whereas in utterances {7-18} physical gestures furnish a mutually intelligible and moment-by-moment *orientation* to an unfolding series of photographic images that are the object of conversation and these gestures work to construct a coherent story. Of course, these simple examples are not exhaustive in any way, but illustrative of the situated nature of photo sharing. More precisely, they illustrate quite clearly that the notion of 'pointing' is a gloss on a host of embodied interactional *gestures* that enable persons using photographs to establish mutual orientations, to furnish topics and to make a host of what might, following the later Wittgenstein [32], be called fine-grained 'grammatical' distinctions that provide for the meaningful use photographs and the practical achievement of 'sharing'.

It might otherwise be said that the recipient designed construction of stories, which is essential to collaboration, *turns upon* a range of gestural practices that give the users' utterances their situated meaning and so allow storytelling and sharing to proceed. Utterances, {1-5} show for example how 'pointing' at an area of a photograph is accompanied by 'tapping' on the area to establish the precise sense of a question. Other common gestures include moving the pointing finger from 'area to area' to draw connections between images, and moving the finger over a photograph in a 'circular motion' to indicate that some commonality between or grouping of the constituent parts of an image.

5. IMPLICATIONS FOR DESIGN

We believe that the vignettes articulate some essential requirements for the continued development of photoware. The first vignette shows that in real-time the sharing of photographs relies upon the distribution of photos across group views and personal views. Photographs move from the control centre to outlying positions to permit flexibility in collaboration and these *local practices of distribution provide a resource for considering the development of computer support for sharing at a distance.*

What is clear from the vignettes is that the physical characteristics of photographs provide an everyday resource that enables users to organize and manage the sharing of photographs. The point extends from the storage of photo collections to occasions of their use. Photographs are physical artefacts that reside in particular locations or 'ecological habitats' in the home [9] where they are to hand and may readily be retrieved on the occasions they are to be used. Furthermore, the physical character of the artefact shapes storage, retrieval and use: photos are certain shapes and sizes, they come in folders in which they are often stored or, alternatively, they are arranged in formal collections or 'albums', and these physical arrangements in turn provide for ease of use (managing distribution from the control centre, etc.).

Organizing and managing the photo collection involves a family of routine practices that are oriented around the physical properties of photographs and their physical constraints then. Essentially, photograph use is situated within a strong *ecology of practices* that provide for the sharing of photos in the home. Examples of these practices include:

- Organizing photo collections for their ready retrieval and use by situating them in a designated place and dedicated storage arrangements that provide for ease of use.
- Manipulating the collection's physical properties to present and arrange photographs to others and to tell a recipient designed story or an occasioned account of the nature of the photograph and its significance 'here and now'.

As we move from physical photographs, which are by their nature ecologically and materially available to inhabitants of the home, to consider digital photography and imagery, the possibility of a *disconnection* between digital photographs and the everyday practices through which photographs are shared becomes increasingly possible, however. While the digital offers significant advantages in the storage and retrieval of photographs, it is less clear how it promotes and supports the practice of sharing photographs, particularly across groups at a distance.

What we have in mind here, what our studies highlight and draw attention to, is that the sharing of photographs between family and friends in the home environment is a practical *achievement*. Sharing is an accomplishment that not only consists of and relies upon the organization and manipulation of photo collections, but also, and importantly, on the *production of accounts* in which the use of collections is embedded. In other words, the accomplishment of sharing consists of three essential components:

1. The organization of photos for ready retrieval
2. The manipulation of the collection's physical properties to distribute photos
3. *And*, the production of an account that gives the photos in hand their particular meaning

Consequently, we must ensure that the future sharing of digital images is not achieved at the cost of losing the very practices that allow photographs to be shared in a meaningful way. We need to develop a set of facilities that not only place photographs into a shared repository and allow users to distribute photographs locally and at a distance then, as we would with any other record, but we also need to augment and support the production of accounts, the telling of stories, and thus support the conveyance of experience.

Existing interfaces might be married together through the development of new software and tangible interaction techniques [19] to support the physical character of photo sharing. Such developments would undoubtedly go some way towards moving collaboration way from single screen collaboration, which previous studies suggest users are averse to [13], and embed the digital in users' natural ecological practices, at least at a face-to-face level. And while we can imagine the networking of such arrangements to support collaboration around control centres and outlying devices at a distance, there is more to the matter than that. Indeed there is a need to complement existing work on digital photograph management systems with their emphasis on storage and

retrieval, and interfaces with their emphasis on face-to-face collaboration, with a consideration of how we might augment the production of accounts and the practical achievement of sharing at a distance.

One way to tackle this is to consider the family of gestural practices implicated in the production of accounts. Our second vignette draws attention to the recipient designed nature of photo talk and the importance of gestural practices to the production of accounts. These practices have a family resemblance to those identified as crucial to collaborative work at electronic whiteboards [23] and in distributed multi-participant 'telecollaboration' [32]. Through gestural practices the body mediates users interactions with photographs and with one another other. Thus, 'the mediating body' [30] highlights objects for perception, draws attention to what is being talked about, and gives photographs their sense and reference or meaning on the actual occasions of their collaborative use.

Accordingly, support might focus on the development of 'telepointing' and 'telepainting' software and interaction techniques enabling distributed users minimally to,

- Point to images and/or their constituent parts
- Emphasize, draw and mark out connections between images and/or their constituent parts
- Indicate groupings or commonalities between images and/or their constituent parts.

Telepointing and telepainting software is already available [e.g. 28, 14] and so development is a matter of marrying these kinds of interaction mechanisms together with existing interface applications. Designers may also wish to consider adding Instant Messaging and audio software to the package to provide a *suite* of tools supporting distributed collaboration.

Supporting the production of accounts at a distance also requires that we take a number of underlying technical issues into consideration, particularly matters to do with shared dataspace that enable users to:

- Use multiple collections (supporting the *ad hoc* assembly of photo stories),
- Distribute photos from a control centre to outlying devices (PDAs, etc.)
- Distribute photos to several outlying devices simultaneously
- Distribute photos between outlying devices
- Coordinate the return of photos from outlying devices

Many of these issues have previously emerged in the development of active cooperative information repositories and the development of appropriate *coordination protocols* [16, 8] to manage sharing. Essentially, sharing at a distance means that users cannot distribute and manage the return of photos to the centre in the same way that they do in face-to-face collaboration, so new interaction techniques are required to support the distributed management of photos amongst a group of dispersed users.

It is also notable that digital photographs, unlike their physical counterparts, are easy to duplicate. The ease of duplication highlights significant issues when we consider the potential to develop support for the collaborative use of

photographs at a distance. Physical photographs allow the distribution of photographs to be readily managed and controlled, as photographs are usually returned to the owner after they are shown and then stored away for future use. There are occasions when photographs are given to others or copies made and passed on, however, particularly amongst family members. Digital sharing mechanisms need to consider how a similar management of the process of ownership and transfer can be achieved and what mechanism might be devised to support this.

The issue we are trying to draw attention to here, and it is we believe a crucial one, is that the control of physical photographs is mediated by the owner(s) of the artefact. In the digital domain, and even within the current limitations on sharing, *control is already distributed* however – when we pass a photo on to another it is theirs to do as they will with. Yet photographs have considerable emotional and sentimental value and the possibility of active distributed sharing raises serious concerns of management and control. For example, how might we feel about photographs of our family members being distributed around the internet without our permission or consent? How might we provide facilities to prevent this and allow owner-centered control to be developed within digital collections of photos? Should users be able to track photographs when they are distributed and recall them to ensure that they retain control?

The possibilities of digital photography and distributed sharing bring into sharp relief issues surrounding privacy and security. Just as those involved in shared awareness systems and media spaces have needed to face the debates surrounding privacy, we also need to consider what that means for the sharing of digital photographs across both distance and time. Currently, the physical storage and retrieval of information allows issues of privacy to be managed in a practical manner. As the vignettes we have presented instruct us, the owners of photograph collections retrieve them from their place of storage and bring them to display to others on the occasions they are required. In doing so, certain photographs are selected, the context of presentation is judged, and the presentation managed as it unfolds. How many of us, for example, have faced the presentation of the ‘embarrassing’ photo of us as a baby to our prospective partners at a given moment by our parents. The point is that these moments of disclosure represent significant judgments that are carried out by those who own the photographs in a particular social context. How then might we provide for this *gate keeping* within technological solutions? Should the owner of the photograph decide when it is available and to whom? Should all requests be made through those who own the photograph?

From an ethnographic point of view it is difficult to find answers to these questions. No doubt they could be formulated, but we believe that these are issues for users to determine in the face of technological developments. It is apparent from our studies, however, that designers need to be sensitive to these issues when developing further support for the distributed sharing of photographs. There is a need, then, for designers to consider the development of a set of *awareness mechanisms* that convey such things as when people are accessing and using digital photographs, where they have been moved to and who is using them. We need to consider how this information can be captured, represented and presented to other users both locally and at a distance and in conclusion we would suggest that work on awareness

tracking and presentation [2] also has a significant role to play here.

6. CONCLUSION

We have employed ethnographic study to explicate the work involved in collaborating around collections of photographs in home environments in order to inform the continued development of photoware. Current ethnographic research into ‘photo-talk’ has identified an aversion amongst many users towards engaging in collaborative sharing through the use of existing digital technologies, which constrain sharing around a single screen. Users employ existing photoware technologies to store and send photographs but then tend to print them off in order to share them co-presently and resort to the telephone to share them remotely. Existing research suggests that there is need to develop ‘image-based communication practices’ to support co-located and distributed collaborative sharing.

Our ethnographic studies of collaboration around collections complement existing research by focusing on interactionally embodied photo-talk to explicate existing image-based communication practices implicated in the real-world, real-time collaborative sharing of paper-based photographs. These studies have drawn attention to the importance of situated arrangements of collaboration and interactional gestures to the achievement of photograph sharing. They suggest that new interfaces not only need to be combined to support situated arrangements of sharing, but that support needs to be extended to augment the *production of accounts*. In their collaborative use, photographs are embedded in the ‘telling of stories’ whereby users convey their experiences. The suggestion here is that in order to develop distributed sharing, designers need to devise solutions supporting the production of such accountable moments.

This requirement raises a number of challenges for the development of digital photoware including,

- Combining collaborative interfaces with tangible interaction techniques to support the movement and manipulation of photographs and to permit the flexibility inherent to real-time sharing.
- Supporting the recipient designed character of photo-talk at a distance through the development of telepointing and telepainting interaction techniques that enable users to make the fine-grained gestures that provide for the meaningful use of photographs and the practical achievement of sharing.
- Devising a range of coordination protocols that enable users to manage the distribution of photographs amongst geographically dispersed participants.
- Devising a range of awareness mechanisms that enable users to control access to and track the use of photographs.

Such developments will move distributed sharing beyond the mere ‘passing on’ of photographs that currently exists, and away from the single screen, and embed photoware in users natural image-based communication practices.

In conclusion we would suggest that there is great potential for the development of photoware for home use. Photographs are to be found in a great many homes and are often shared amongst family members and friends, both in face-to-face encounters and remotely. While digital photography is rapidly becoming a part of the fabric of everyday life, there is still

considerable room for the development of computer support for cooperative work where the sharing, as opposed to the taking, of photographs is concerned, however. We offer this paper as an early exploration of the real-world, real-time challenges facing designers wishing to make this move.

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