Cherish: Smart Digital Photo Frames for Sharing Social Narratives at Home

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Abstract

The introduction and rapid acceptance of digital cameras has fundamentally changed the way people take and share images. When displaying and interacting with images in the home, people still print out the photos as if they had been taken on a film camera. Although sharing occurs on computer monitors or even on TV, the digital photo hasn't made complete circle in being represented digitally in a home environment. This research explores the display and social interaction with digital photos in the home.

To find design opportunities we used a user-centered approach and studied how people currently display and interact with photos at home. Observed needs were used to generate concept scenarios that were validated with representative users during a concept validation session. Out of this has emerged the design of Cherish, a system for organizing and displaying photos in the home.

Keywords

Interaction design, interface design, digital photo frames, digital photo display, story telling, co-experience, family, home

ACM Classification Keywords
H5.2. [User Interfaces]: User-centered design.

Introduction
The introduction and rapid acceptance of digital cameras created a paradigm in the way people record and review images of everyday life. From the invention of the camera obscura [1] to the modern day film-based cameras, cameras allowed people to more easily capture, reproduce, and share visual narratives. However, the time and money needed to process the film and print the pictures strongly influenced people's behavior. Digital cameras invoked a change by allowing instant review of photos taken, easier duplication and sharing, all the while still supporting the overall need to capture and share visual narratives.

People's reasons for recording images haven't changed. However, technology has changed to support and enhance their experiences in making photos. As film-based cameras became more robust, easier to use and cheaper, people expanded the role of photos from capturing special events to capturing everyday moments in life. People shared photos by sending them through the mail, constructing albums, and displaying them in photo frames in their homes and offices. While digital photography has changed the capture and electronic sharing of photos, the construction of albums and the display of photos in the home have not been greatly affected.

The home computer has become a digital archive, taking on storage, retrieval and display duties; however, its location in the home and its aesthetic appearance limit the type of sharing and social interactions that happen. For presentation most people still print out physical images for display and interaction in the home. Somehow, the digital photos haven't made the full transition to support people's existing behaviors when sharing the photos. Furthermore, current digital photo frames have not yet addressed these needs in the home.

This paper explores opportunities for digital photos to complete their evolution by exploring presentation in the home. Following a user-centered design model, we have conducted ethnographic research in the home: exploring both the display of and social interaction around photos and constructing a series of prototypes that explore how digital images can play a more appropriate role.

Related Work
Secondary Research
Significant contributions have been made for organizing and browsing digital photo collections at home. Examples are Requirements for Photoware, PhotoMesa: Zoomable Image Browser, Living Memory Box, MyPhotos, smartAlbum, and FotoFiler [2,3,4,5,6,7]. The software allows people to access their collection visually, categorize photos and organize them using a folder metaphor. However, this work has generally ignored issues of presentation and social interaction around images in the home.

Competitive Analysis
Services for sharing digital photos are plentiful. From e-mail to Flickr, people have many opportunities to enhance their sharing experience with people at a distance. However, there are few services for people to share digital photos within their home unless they print the digital photos on paper and use albums or photo

frames. Products such as iPhoto and other first party software from camera manufacturers support users ability to print individual photos or make albums through a service. They also support sharing digital photos using the Internet for distance sharing.
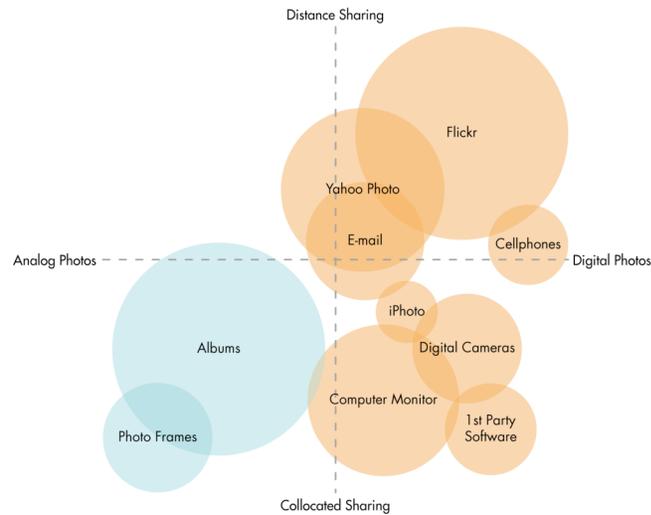
Figure 1. Competitive analysis: Perceived space for analog photos (blue) versus digital photos (orange) occupy.

User Research

Contextual Interviews
During our user research we conducted contextual interviews and observed the activities of eight families to find out how they displayed and interacted with photos in their homes. During the interviews, families were asked to show where they kept and displayed photos and to share stories about social interactions they had in the home in which the images played a role. All the families had traditional film-based cameras

but found themselves using the digital camera more for its convenience; i.e., digital cameras allowed them to view their photos instantly. During the interviews digital photos were taken for mapping out where the photos were displayed in the home.

After the interviews, maps were made to reflect where the families had photos displayed or stored, and what kind of photos they had for display.
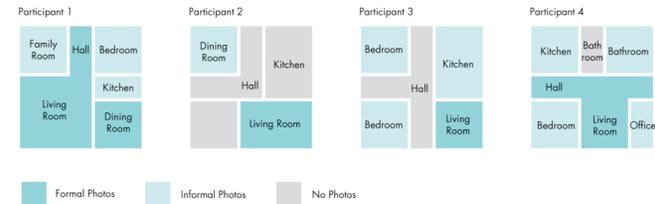
Figure 2. Maps of analog photos displayed in homes of interviewed families.

Findings
These maps revealed families have formal and informal spaces for displaying photos. Formal spaces were living rooms, entryways, and bathrooms. Photos displayed in this space were posed, taken professionally, or taken by a family member and followed a theme. Informal spaces were bedrooms, family rooms, and the kitchen. Here, photos were candid, personal, and captured the moment. Photos in formal spaces are more up-to-date than photos in informal spaces, with the exception of the kitchen. The kitchen, especially the refrigerator, was a focal point for most current photos formal and informal, updated and most accessed by family members.
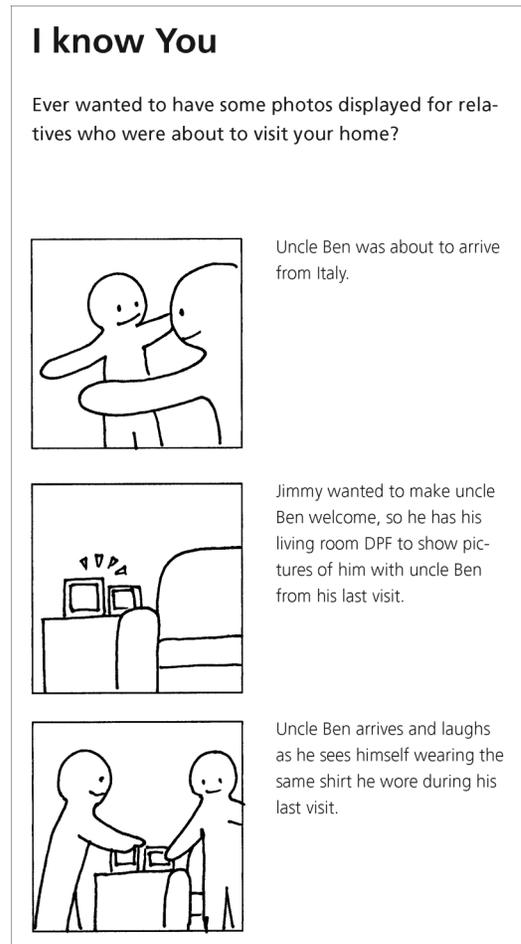
When guests came for visits, photos in formal spaces were often used to start a conversation, but informal spaces, especially the refrigerator, was the central location for sharing photo narratives. Family members don't always organize their photos since they are aware of the context. Instead they label them by time because that specific information can be forgotten.

When families shared stories about the photos on display, they always started by who was in the photo—the social connection between themselves or the person they are engaging with—and what the event was. This supported the idea of how people organized and recalled photos [6,8].

Photos in formal spaces and majority of informal spaces were in photo frames while some empty frames were hung, waiting to be filled.

Concept Validation

We developed fifty concepts based on the synthesis of our user needs. These addressed our observed needs for people to access, share, and display photos at home. These concepts imagined a future smart house full of digital frames as well as technology for recognizing who was in the home. We reduced this set to twenty-one concepts by focusing on specific user needs. Following the concept generation we conducted a concept validation session where we shared the concepts with a group consisting of one member from seven different families. We presented the concepts, using them to further explore the user needs, looking specifically for overlaps between the needs we had observed and the needs the participants perceived in themselves and their families.

I know You

Ever wanted to have some photos displayed for relatives who were about to visit your home?

Uncle Ben was about to arrive from Italy.

Jimmy wanted to make uncle Ben welcome, so he has his living room DPF to show pictures of him with uncle Ben from his last visit.

Uncle Ben arrives and laughs as he sees himself wearing the same shirt he wore during his last visit.

Figure 3. Context-aware smart digital photo frame concept.

Feedback
Participants provided rich feedback on the concepts and below we detail some highlights from this session.

The concept of using digital photo frames as an interface to access the photo collection was well received. This allowed people to view digital photos away from desks where computers are and in a place in the home where photos are traditionally viewed.

Editing and annotating as people viewed digital photos from the digital photo frame was a novel way to interact with their collection. This allowed the users to respond as they view the digital photos rather than having them return to the computer to perform these actions.

Issues of sincerity and appropriateness were discovered as digital photos were changed by the system. If a person doesn't have a relative's photo displayed regularly, but changes only when the relative visits, it seemed to make the person insincere.

Solution: Cherish

As many possible solutions were generated to address the opportunities, there are two areas of focus: how digital photos should be organized and how digital photos should be displayed. When considering organizing a photo collection, Cherish can learn to recognize people in digital photos to have relationships with the people they are being photographed with (i.e. family, father, mother, son, daughter, cat, dog, grandpa, grandma). Cherish will mediate digital photos to be displayed using social relationships as labels, and the user can direct which photos should be displayed in formal and informal spaces in the home. The home uses wireless digital photo frames to receive distributed image content from user's computer. Using sensors from the UbiComp Smart Home, when relatives or

friends visit, Cherish can display photos of visitor and the family in the formal/informal space.
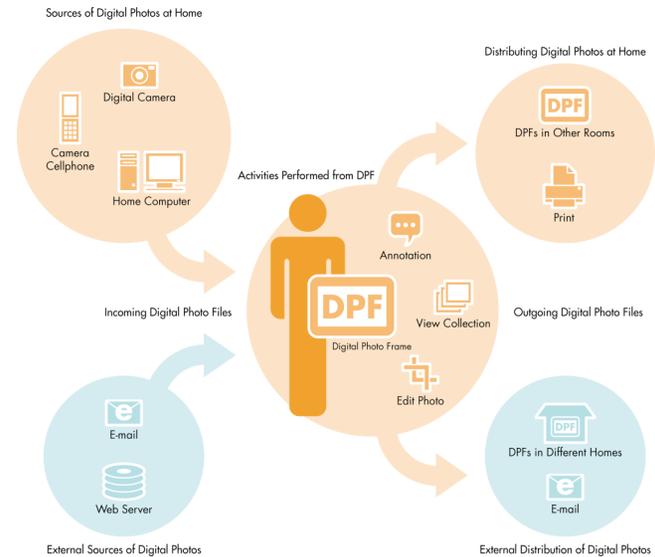

Figure 4. Cherish System Interaction Model.

The goal for Cherish digital photo frame system is to create an opportunity for enriching the social interaction and co-experience [9] among family members and visitors to the home through mediating digital images displayed electronically. Digitally represented photos no longer need to be formatted like traditional photos. Series of digital photos being actively displayed can create an opportunity for a continued narrative in the home for families and guests.

Design Implications

People want to add meaning to their lives and be able create meanings into coherent and significant narratives in the process [2]. Storytelling and reminiscing using photographs are one way of keeping and sharing memories [10]. Being able to display digital photos in a social context helps users continue their narratives, continue to recollect experiences past and hopefully look forward to creating new memories to be shared. Allowing for better opportunities to access their digital photos helps users to spend more time reliving past experiences and less time searching or organizing. Designing for digital photos to be distributed in the home environment allows for co-experience among family members, visitors, continuing their storytelling without the time delay of traditional methods of displaying photos.

Future Work

Currently we are still refining the Cherish design and will soon begin a round of paper prototype testing. Based on the feedback from these tests we will develop a working system and perform an evaluation using a collection of digital family photos.

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