

Faculdade de Engenharia da Universidade do Porto



**FEUP**

## **Photo Wallet: Interface design for simple mobile photo albums**

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## Resumo

Os sistemas operativos dos dispositivos móveis têm-se tornado tão robustos e cheios de recursos, que estes começaram a ser considerados similares a "mini computadores". A consequência disto, é a explosão de aplicações desenvolvidas por designers e programadores independentes em torno destes novos sistemas operativos e que permitem aos utilizadores executar uma grande variedade de tarefas para o trabalho e o entretenimento. Cada vez mais, os dispositivos móveis atuais oferecem câmaras, conectividade a redes sem fios, ecrãs de alta resolução, e vários recursos multimédia que podem ser aproveitados com a utilização dessas aplicações.

Esta Dissertação de Mestrado aborda o design da interface gráfica para uma aplicação chamada "Photo Wallet", projectada para funcionar em dispositivos móveis com ecrã táctil para aproveitar a natureza ubíqua e a portabilidade dos smartphones com câmaras. A aplicação "Photo Wallet" é inspirada no conceito de fotografias impressas mantidas na carteira de uma pessoa para partilhar com amigos e conhecidos durante conversas informais.

Depois de realizar uma pesquisa em teorias sobre fotografia e vários estudos académicos sobre a forma como as pessoas gerem a sua biblioteca de fotografias digitais, durante o processo de projeto foi determinado que a aplicação tinha de abordar as funcionalidades principais: 1) o apoio ao processo reminescente associado ao folhear fotografias de eventos passados através da implementação de álbuns criados pelo utilizador, e 2) o apoio do componente intrínseca à narrativa fotográfica, com a inclusão de uma funcionalidade nova que permite aos utilizadores visualizar fotografias relacionadas entre si de acordo com tempo/data similar, geo-localização e reconhecimento de dados dos rostos das pessoas.

Após os requisitos da interface gráfica terem sido estabelecidos, foi construído um protótipo interativo baseado no sistema operativo iOS atual para a plataforma móvel da Apple. Este protótipo foi submetido a testes de usabilidade para avaliar a eficácia e facilidade de uso da aplicação. Para este propósito, um pequeno grupo de utilizadores foi reunido para realizar várias tarefas e interagir com o protótipo; depois, eles foram convidados a preencher um questionário para fornecer comentários sobre usabilidade e para determinar se os objectivos do projeto foram atingidos. Depois de avaliar os resultados, concluiu-se que a interface gráfica proposta cumpre com as exigências, demonstrando que as aplicações para dispositivos baseados em ecrã táctil ainda apresentam vários desafios na adoção de novos utilizadores uma vez que nem todos eles têm suficiente experiência nas tecnologias móveis atuais. Fica para os designers de interface de utilizador a tarefa de criar experiências de utilização simples com mensagens claras e fáceis de compreender.

## Abstract

The operating systems of mobile devices have become so robust and fully featured, that have started to turn smartphones and other similar equipments into “mini-computers”. A consequence of this is the explosion of applications developed by independent designers and programmers built around these new operating systems that allow users to perform a wide variety of tasks for work and enjoyment alike. Increasingly, current mobile devices even offer cameras, network connectivity, high-resolution screens, and several multimedia capabilities that can be taken advantage of with the use of these applications.

This Masters Thesis consists on the interface design for an application named “Photo Wallet”, designed to work on touch based mobile devices to leverage the ubiquitous nature and portability of smartphones with cameras. The “Photo Wallet” application is inspired by the concept of print-out photographs kept in a person's wallet to share co-presently with friends and acquaintances during casual conversations.

After conducting a research on several photography theories and academic studies on how people manage their digital photography library, during the design process it was determined that the application had to address to main functionalities: 1) the support of the reminiscing process associated to browsing photographs of past events via the implementation of user created albums, and 2) the support of the storytelling component intrinsic to photographs, with the inclusion of a novel functionality that allows users to view photographs related to each other according to similar time/date, geo-location and faces recognition data.

Once the requirements of the interface were established, an interactive prototype was built based on the current iOS operating system for the Apple mobile platform. This was then submitted for usability tests to assess the effectiveness and ease of use. For this purpose, a small group of users were gathered to perform several tasks by interacting with the prototype; afterwards, they were asked to fill out a questionnaire to provide feedback on usability and to determine if the objectives of the design were met. After evaluating the results it was concluded that the interface met the requirements, and showed that applications for touch based devices still present several challenges in adoption with new users since not all of them have enough experience with current touch based mobile technologies, leaving to user interface designers the task of creating seamless user experiences, with clear and easy to understand messages.



To Luis and Gabriela,  
because we'll make it together

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# Chapter 1

## Introduction

Photography became a mundane practice after the introduction of roll-film cameras almost a hundred years ago. Amateur practices and perspectives have interested anthropologists like Richard Chalfen [1]. Chalfen studied how snapshot pictures of everyday life in the USA were possessed and valued, and what made people consider something to be a good picture. His studies led to questions about if and how people will create new photographic practices as novel technology such as video would become part of everyday life. Literature theorist Susan Sontag [2] has written about the early significance of everyday photography, how it developed simultaneously with tourism, and how, for example, the camera was used to record special events and could be experienced as having something to do in a new situation. These authors often discuss photography from the perspective of the resulting pictures, what they picture and why and how people value them.

In recent years, the advent of digital photography for domestic use is fostering a radical shift in the amount of images produced by members of the household. Now, not only the parents have a point-and-shoot camera to document the important moments, events and milestones of the family group, but also the youngest members of the family are able to take advantage of the digital technology to record their own images and produce their own personal archives.

Simultaneously, mobile phones have also expanded their feature set and now are also able to offer even more features than just communication via phone calls and text messaging. Mobile devices are connected to networks, offer full color and high-resolution screens, and are capable of providing multimedia capabilities and entertainment. Some mobile devices (like Apple's iPhone/iPod and Android ready mobile phones) are focused on offering personal entertainment capabilities, like music, video, games and photography. Increasingly, the incorporation of cameras to such devices has expanded the context and amounts of photographs produced.

With this “More is More” approach to photography over the past few years many systems have been developed to archive on the desktop and share all these images in a fast and efficient way by leveraging the accessibility of the web (Flickr<sup>1</sup>, Google Picasa<sup>2</sup>, Kodak Gallery<sup>3</sup>, etc.). These archives afford user-to-user interaction through the computer screen, but they lack the tactile, and consequently, emotional feeling and connection that only a printed photograph is able to provide. This makes the storytelling component of the photograph difficult to grasp, forcing the observer to remain passive during the observation.

It is very important to be reminded of one of the intentions of digital photography systems in the household and what their main activity entails. They serve the purpose of supporting memories, foster human-to-human storytelling and develop a sense of identity. Even the main purpose of family photography is to treasure their memories through printed photography archives, thus transcending the test of time leaving out the concern of digital platforms not supported in the future.

New challenges have arisen in the ways people want to display and share their many images. Consequently, it has become the work of user interaction designers to figure out ways to present a simpler approach to consumer and domestic photography by taking into account the “new” mobile aspect of the activity. Many efforts have been conducted to facilitate the user with novel and inventive ways to share their photographs and several prototypes have been developed to test the users’ preferences regarding photography software.

This project will attempt to encourage a new way to share stories with photographs by leveraging the convenient way mobile devices are always at hand, and by taking advantage of the capture data of each photo to make associations between several images and retrieve memories from these similar images.

## 1.1 Problem Statement

In recent years a lot of research material has surfaced on how to design for new photographic experiences in HCI taking into account both the desktop experience of archiving and cataloging large amounts of images, and the mobile aspect of digital photography by using devices with photographic capabilities. Simultaneously, mobile commercial applications have been developed for the purpose of image editing, instant web sharing, and some social network experiences around photography. But these investigations and products don’t offer enough focus on the experimental aspects of applications geared towards a more playful, creative and aesthetic experience about digital photography.

Most mobile applications offer good functionalities for editing and web sharing but they lack the organizational functionality and tactile feel desirable if the images taken with the mobile device were to be shared co-presently. Moreover, mobile photo albums

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<sup>1</sup> <http://Flickr.com>

<sup>2</sup> <http://picasa.google.com>

<sup>3</sup> <http://www.kodakgallery.com>

capabilities have not being exploited sufficiently in mobile devices to encourage storytelling and the retrospective process of accessing memories often associated with building photo collections. In this way, a new kind of interaction with the photographs taken directly from the mobile device would be desirable if users were to have their photo albums always available at hand to support social storytelling.

## **1.2 Project Proposal**

By drawing inspiration from studies conducted to current practices in the preservation and cataloging of domestic photography, and viewing mobile devices as snapshot cameras, an interface for mobile devices will be created inspired in printed photographs in a wallet around two modes of building stories to share co-presently (directly on the device):

- Implementing the option to create personalized collections by the user.
- Implementing a way to build stories sprung from one single photograph by retrieving the associated photos with similar characteristics. This free-mode to create stories presents a different storytelling paradigm because each photograph will have several ramifications to different stories.

## **1.3 Objectives**

1. To design an interface for a mobile device that can provide an easy way to manage images and that is able to build albums based on relevant categories for the user around stories of events.
2. To establish a simple way to access different stories from a single photograph by accessing different arrays of images that share the same metadata.
3. To encourage the storytelling component of the images by designing an interface that is able to foster the access to memories of the events captured with the mobile device.
4. To instill a sense of emotional attachment to the images captured with the mobile device by embracing the analog photography metaphor.

## **1.4 Project Motivation**

Since the invention of cameras, people have been fascinated with the magic of capturing moments of life instantly. Photographs have changed the way people tell stories of their lives. An early study conducted by anthropologist Richard Chalfen (1987) shows that photography was not simply a medium for capturing facts, but also for communication. Chalfen stated that photography was used as a model of interpersonal communication based on images, and different kinds of events are captured on photos to share with family members, relatives and friends.

Furthermore, it is safe to assume that a person's life comprised of milestone moments and journeys can easily be tracked by the events they deem to be relevant enough to be captured in a photographic image. People caption and organize photos into a



set of meaningful photo collections, coining the term ‘album’, to refer to a collection or archive of organized printed photos. Good photographs may be assembled into these thematic albums, usually in chronological order, but what usually happens is that a single or very few photographs tend to stand out for special attention springing storytelling rather than developing a narrative over a sequence of images similar to a comic book.

So this activity of choosing single photographs to fill in the in-between of the story behind it to share in conversations, and the consequent reduction of the entire photo collection to a single or just a few photographs that encapsulate an entire event, leads to the assumption that consumers don’t need more images to tell their story, instead they need fewer images with more significance that can be accessed in a simpler way during multiple situations. This fact can provide a creative avenue for a new interface metaphor to be implemented in camera-able mobile devices.

From a storytelling standpoint, when sharing photographs in a social context, conversations don’t often follow a linear course, what often happens is that people jump from one point to the other without following a chronological order. By taking this issue into account, the interface will also provide a way to follow this free pattern of storytelling by providing a way to access associated stories.

## 1.5 Methodology

- Study of current practices around home photography – this initial step is necessary to understand why people take photographs and the importance and meaning given to the events preserved in the images, also to understand current day practices around the storing and cataloging of this images using photo management software.
- Evaluation of existing photography software – this evaluation involved an analysis of state of the art software for desktop and mobile use to manage and catalog photo collections to be able to understand what has been done to address user needs.
- Analysis of interface requirements – an analysis was performed of the possible functionalities offered by the interface by analyzing user behavior of photography software on the desktop after a small market research was conducted.
- Prototype interface design – the design of the interface is implemented by applying new conceptual models to the application functionalities.
- Usability tests – during this stage the interface was tested within a selected group of users to assess the effectiveness of the conceptual model.
- Results evaluation – at this final stage, the results of the usability test were measured to asses if the interface provides the best user experience and accomplishes the main objectives of the project.

## Chapter 2

### Photography experiences

What are the experiences associated with popular or amateur photography? This chapter will provide some historical background and anthropological studies on why people take photographs and the emotional attachments to the resulting images, and describe some recent research concerning interactions with photographic devices and, specifically, camera phone use.

#### 2.1 Photography practices

In the 19th century camera equipment was still expensive and demanded professional expertise. It was not until the early 20th century when George Eastman came up with the innovation of the dry photographic plate and roll film that photography came into everyone's hands. Eastman started to produce inexpensive and hand-held cameras that only require the photographer to press a button, and the film could be handed in for development. Suddenly, the art of photography had become a creative practice for ordinary people. This also redefined who had the right to capture domestic and everyday life [3], and resulted in that ordinary people could develop interests in taking pictures. In the seventies and eighties, digital photography did not yet exist, but photography had still become a natural part of everyday life. At this time, two important bodies of work emerged examining and describing photographic practices and their emotional significance. The first analysis was done by literary theorist and novelist Susan Sontag [2].

##### 2.1.1 Photography and the experience of a situation

To take pictures can be a soothing experience that lessens anxiety. It can be experienced as having something to do, also in an unfamiliar setting. However, just as photographs can certify an experience, photography can refuse and limit the experience. Whenever

something remarkable is encountered on a trip and one stops to take a picture, this will shape the experience. Sontag describes how this “search” for the photogenic can convert the photographer’s own experience into an image or a souvenir, often disconnecting the photographer from a social situation. In this regard, the photographer will become part of the social situation when sharing the photographs using albums to present the images to a listener.

### 2.1.2 Interaction with the world

Picture taking is not simply an encounter between an event and the photographer. It is an event in itself “with ever more peremptory rights to interfere with, to invade, or to ignore whatever is going on” [2]. However, possessing a camera does not license intrusion. Sontag gives the example of China, where it is considered a ritual right to pose in order to look your best. Overall, a photographer may encounter social situations where it is considered more or less suitable to take pictures, in this situation the reward will come when the photograph is consumed and valued because of its content.

### 2.1.3 The value of photographs

An early popular use of photography was to memorialize achievements, such as a wedding. This is still as much part of the ceremony as the other prescribed formulas. Popular use of photography also developed in tandem with tourism, where photographs would “offer the indisputable evidence that the trip was made, that the program was carried out, that fun was had” [2].

Anthropologist Richard Chalfen, drawing from a series of field materials and interviews about home photo and video use, explores the question of what are photos and video for. He proposes that these materials operate, not as copies of reality, but as statements people can make about themselves in “home mode communication”. Photographs happen to be one particular record or token of experience, which people seem to find useful to remember the experience, to reflect on it, to display it, and to talk about it.

### 2.1.4 Domestic iconography

The literature offers almost no other theories about domestic photography practices, than the one found by Frohlich [4]. Figure 2.1 shows the proposed framework to understand some of the key actors and activities in domestic photography.

The four key actors are the **photograph** itself, the **photographer**, any human **subject** in the photograph, and external **audience** members of the photograph who were not present at the time of its capture. Six key interactions between these actors are represented by the connecting lines between them. Half these lines, shown dashed, represent solitary interactions between various people and the photograph itself. The other lines, shown as solid, represent social interactions between the photographer(s), the subject(s) and the audience(s). In a photographic context, all these social interactions also involve the photograph as an equal participant. This means that each simple interaction

involves a triangular three-way communication around a photograph. The equal division of solitary and social interactions with a photograph, represented in the framework nicely captures the dual role of the domestic photo as a private and a public document.

Family photographs and albums appear to be repositories of private memories and carefully designed versions of family history, an identity is both something that is seen in a photograph of oneself as subject, or deliberately presented to others for interpretation and response [1]. Narrative is a form of interpretation an audience can read into a photograph, or a story that can be told from a photograph by a photographer or subject.

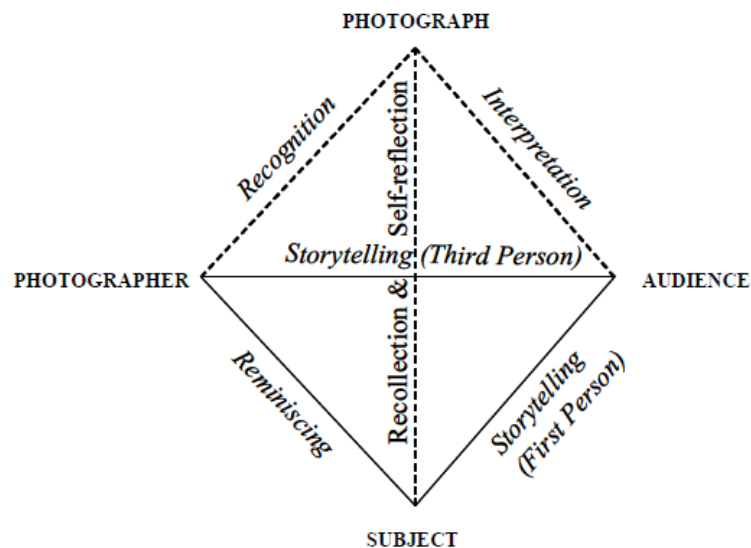


Figure 2.1. The diamond framework for domestic photography

### 2.1.5 Interaction with images on the web

A qualitative study performed to provide an insight on how people use images on the web and how the viewer relates to them showed that images are often intertwined with the ongoing process of learning about the world, e.g. for learning and research purposes specific to every user. Images provide a compelling source of entertainment and inspiration, they help create connections to other people and remote places and, ultimately, they provide a way of navigating both the Web and the physical world. And via online photo album services they help us reminisce about our personal past [5].

At a personal level, images on the web have started to replace regular physical photo albums. It is easier to share family and personal events by indicating a selected audience of family members and friends a link to personal repositories of images on the web at very cheap prices or even at no costs [6]. The Facebook<sup>4</sup> platform has started to serve this purpose for Internet users and, very rapidly, has become a medium for self-representation and an establishment for social interaction with users' social circle. This self-representation phenomenon has even extended to daily public exposure by displaying

<sup>4</sup> <http://facebook.com>

personal everyday life using pictures taken with mobile phones and tagging people in photos [7].

## **2.2 User needs and motivations in sharing life memories**

Saving memories is a universal human phenomenon. People collect numerous non-material and material things throughout their lives to remind themselves of the past. Some of these things are shared with others but not all types of moments in life deserve to be saved or shared. The most valued memories can be categorized into three classes [8]:

- Happy moments (related to long term memory)
- Life history (long term memory)
- Details to aid taking care of the daily errands (short term memory)

Saving and sharing happy moments in life history data serves long-term memory. Currently, photo albums, diaries, collection of personal video recordings and archives or other tangible mementos serve these needs. Saving detailed notes to aid in daily errands serves more short-term memory and corresponds to using calendar, notebook or PDA.

Olsson et al. conducted a study to evaluate user needs for digital services to aid in the collection and sharing of life memories. These are the needs reported by the group of users under study.

### **2.2.1 Memories are of emotional value**

Emotional value of an event is a crucial element of memory. All events that have invoked feelings are experiences worth remembering: birth of a child, graduation, a wedding, etc. these are the events people usually capture photos and videos of.

True memories cannot be saved electronically, but technology can provide aid for remembering certain key elements of the events. Without these aids the memory may weaken, change its character or be forgotten.

### **2.2.2 Motivations for sharing**

Online sharing of memories in general is an accepted idea, but this does not mean that everybody wants to share everything. Instead, is more valuable to have control over granting right to browse or edit the saved memories. It almost becomes a privilege to be granted access to friends' photo collections.

### **2.2.3 Trust and ethics in sharing of memories**

New social codes are needed for saving public events. People need to know if their presence or behavior can be saved in a particular event, and have the right to deny from being saved or to be removed from the recording.

The issue of trust is also important in regards to the place where memory data is saved, and to provide a sense that the material will not get lost or destroyed, and can be accessed whenever and wherever is wanted.

## **2.3 New camera designs: The ubiquitous camera**

The nature of home photography is changing, as the use of digital cameras became the standard for image capture. The shift from paper prints to digital images has sparked a number of changes in people's practices with their personal collections. One is the increase in size of people's collections as the costs of film and printing no longer become a factor to consider and the costs of digital storage decrease. Not only are more pictures being taken, but people are taking more pictures of the same subject from different angles. Increasingly, people are also editing and playing around with the images with image editing software, thus producing even more images and variations.

Different camera designs support different interactions, enjoyment and significance of taking pictures. Digital communication technologies bring new reasons for taking pictures and new things that people take pictures of. With camera phones, pictures can be taken as functional images that are used in place of writing, copying, scanning. Pictures can also be taken and sent as a way to communicate when people share a common ground, as a humorous comment, or instead of another type of communication. These images are usually shared with people who were not present at the time of capture. There also exists another dimension of picture taking with camera phones that revolve around an affective component, using the images either to share with someone at some other time different than the time of capture or for reminiscing privately [9].

Because of their ability to capture and share images everywhere, people usually use camera phones as personal books of images. This also facilitates easy sharing and personal reflection. Capturing and viewing anywhere also supports more task-related functions, such as documenting an event or creating personal reminders [10].

Finally, people capture images with their camera phones in places where they often have conventional cameras with them, such as at home, weddings, and planned trips. However, camera phones are used almost as often in places where people typically don't have cameras – at work or school, in social venues such as pubs and restaurants, and when “out and about.” Moreover, there exists a sub-genre of images depicting unconventional subjects, which are taken spontaneously for reasons such as amusement, experimentation, or curiosity [10]. The camera design is not the only avenue to provide with a certain experience when taking pictures or when viewing them. Even if a design is intended for certain purposes, users will assign their own meaning to it [11].

## 2.4 Photography work

The nature of home photography has permanently changed with the use of digital cameras; this is because in the last decade an immense amount of digital photography related products and services have been developed to aid in the several tasks involving this activity. Initially, the industry focused on the provision of digital cameras, photo scanners and photo-quality printers, which essentially emulated the conventional photography paradigm in order to facilitate home development of photos. The current technology offerings are more focused into other stages of the conventional photo life cycle, especially to support storage, sending and sharing of photos on-line. This second generation offerings might be referred to as photoware, since they provide different forms of collaborative software around photos.

### 2.4.1 Dimensions of photography software

The new paradigm around the digital photography practice provided important questions for researchers who wanted to formulate a new framework to assist in the development of future software for sharing photographs. HP Labs sponsored the most important study, since at the time this market was highly PC-centric. Frohlich et al. [12] formulated a characterization for various photoware technologies in Table 2.1. These include conventional as well as digital tools (digital shown in gray background). The first column of Table 2.1 shows that photos can, in principle, be exchanged synchronously between people co-located in time and place or separated by distance. This kind of real-time interaction around photos is referred to as sharing. The second column of Table 2.1 shows that photos can be exchanged asynchronously between people (i.e. at different times), by accessing a shared photo archive in a fixed location or by sending photos to others in a remote location.

Table 2.1 Dimensions of photoware with example products and services

	<b>SAME TIME</b>	<b>DIFFERENT TIME</b>
<b>SAME PLACE</b>	Prints Slides & projector	Shoeboxes Albums & frames
	<b>CO-PRESENT SHARING</b>	<b>ARCHIVING</b>
	Photo viewing software & devices	CD-ROM, PC filestore Photo website
<b>DIFFERENT PLACE</b>	Telephone	Mail
	<b>REMOTE SHARING</b>	<b>SENDING</b>
	Application sharing. Instant messaging. Video conferencing	Email attachment or website reference. Internet photo frames

The research questions of this study guided the entire collection of data and further discussion of the results to provide with enough information to predict the success of all

the digital technology presented in Table 2.1, and to design future photoware that satisfies real users need.

- Q1. What do users want to do differently with photos once they have captured them into the digital realm?

- Q2. What do users do with conventional and digital photos once they have captured them?

The next set of activities provides an answer to the life cycle of the photo after the capture (Q2)

### 2.4.2 Archiving

People store and organize their photo collections to be viewed by themselves or others at a later time. The **filtering and arrangement of “favorite” prints into albums** is seen as the best way of archiving conventional photos for future sharing. Unfortunately, the discipline required to do this is too much for many people and it presents certain difficulties. At times, it gets frustrating to remember details of people and events depicted in old photos. When the images are recent and everyone who participated is still alive, there is not as much “demand” or “perceived value” for detailed annotations. As time goes by and people begin to forget the details, they wish that the annotations existed.

While most people focused on issues around creating chronological photo albums, several people described more **specialized photo activities** such as creating collages, putting together special “milestone” projects to mark a significant life event such as a birthday, graduation, wedding or anniversary, etc. These activities offered a more enjoyable environment for cataloging and creating albums.

Most families use the Windows folder as a container of digital photo packs as the equivalent of development pack sleeves. One reason why families paid so little attention to the presentation and arrangement of digital photos on the PC was that they never saw the PC screen as a convenient vehicle for synchronously reviewing and sharing those photos with others. The main reason was that **digital photography had not replaced conventional photography**.

### 2.4.3 Sending

Compared to archiving practices that seem sporadic and vary widely among families, **sending practices are remarkably common and consistent** over email or web channels, and experience great joy in receiving photos from others. An important characteristic of these photo-sending activities is that they are embedded in ongoing interactions and relationships. In this way families experience as much **joy from the feedback and subsequent conversation around the photos sent**.

The “embedded” nature of digital photo sending made **email attachments preferable over web publishing** for sending individual images of small photo sets. This is because email is designed to support an ongoing textual conversation that can be enhanced with images. At the time of this study Facebook was not an available platform for connecting to other people and sharing photographs, so it is important to consider that



new technologies have become the favorite avenue for many users to share images with others.

#### 2.4.4 Co-present sharing

Of all methods of interacting around photos, **sharing photos in person was described as the most common and enjoyable**. Such co-present sharing was seen as a way of re-creating the past and reliving the experience with other who were there at the time. In contrast, many participants of the study reported being discouraged by the notion of looking at digital photos on a computer screen when sharing with friends and family. To these participants, **images on a computer screen were too abstract, lacking the tangibility and manipulability of physical photographs**.

This study reported another important assumption about photo-talk, in that involves a kind of storytelling with images [1]. **Storytelling was only present in a subset of conversations**, namely those in which the photos are being shown to others who were not there at the time the photos were taken and hence do not share the memory represented by the photos. Another sort of talk is referred to as reminiscing talk, where the conversation involves sharing photos exclusively with members of the original capture group. The value of reminiscing is in recalling the details of experiences with others while the value of storytelling is in communicating status, experience and wisdom to others. A typical feature of **reminiscing talk** is it involves jointly “finding” the memory together, only to leave the memory without any further elaboration.

This examination performed by Frohlich resulted in several hints and predictions on how future photoware should be designed and implemented:

- Future technology should help users in their socialization of digital photography products and services, in order to extend how digital photos are shared across a range of contexts.
- Instant photo sharing where the immediacy of photo sharing achieved on the back of a digital camera might be reproduced remotely. In a situation where one partner is mobile, this would allow the mobile partner to share aspects of a live experience with a remote family member or friend.
- Augmented prints to build on the foundation of printed photo sharing rather than replacing it with forms of screen-based photo sharing. A novel way of augmenting prints would be to support the playback of associated audio information from paper.

## 2.5 Unpacking photowork

### 2.5.1 The photograph lifecycle

Digital photos offer unique opportunities to the user. They offer certain affordances that print photos do not provide. With digital imaging, the traditional role of the user as a picture “taker” into a picture editor, developer and printer as well changes with the

opportunity to edit images and to print them. This also means that dealing with images encompasses work with individual photos as well as work with collections, increasing the potential amount of work required. The other side effect of this is the added complexity in users' collections. In order to understand how users work with these complexities on the digital realm another study adds to the previous one performed by Frohlich et al. by considering the 'life cycle' of the digital photo from its moment of capture to its subsequent use.

In Figure 2.2, Kirk et al. [13] illustrates the resulting key activities that are integral to photowork. This is further divided into three stages having to do with the capture of images, subsequent download to a computer, and then activities around preparation for sharing. It's important to note that this study examines the process with both PC software and Mac software (iPhoto<sup>5</sup>).

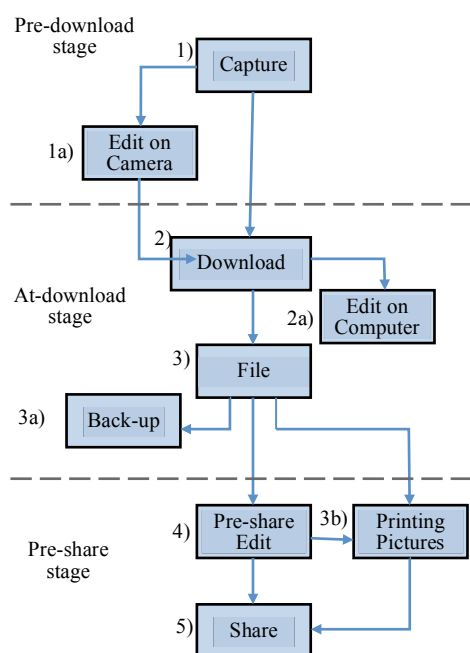


Figure 2.2 Flow diagram of photowork lifecycle

### 2.5.2 “Pre-download” stage

Photowork could begin just after the moment of image capture were people would often engage in a simple editing process on the camera itself (activity 1a in Figure 2.2), either to delete unwanted shots or deleting pictures with poor quality.

### 2.5.3 “At-download” stage

Downloading is technically-driven, event-driven, or goal-driven, for some this downloaded images were immediately filed and archived, however, other people performs some work

<sup>5</sup> <http://www.apple.com/ilife/iphoto/>

on their images by doing reviewing and deleting or some form of editing (activity 2a), such as cropping, color corrections, etc. After this activity, the filing and archiving process is usually performed by assigning folders to each event using relevant naming conventions for the user, like date-event-name. The backing-up of pictures (activity 3a) is usually done when hard drive space is compromised or when CPU performance has decreased.

#### **2.5.4 “Pre-share” stage**

Pictures to be shared were sorted and selected from a bigger set of possible pictures and moved to another folder. Printing has an important relationship to filing, archiving and sharing behaviors; some people desire to print digital photos in order to add them to existing print albums. The most performed action is to take the pictures inside the new folder to an automatic printing facility.

This photography work study provided with several understandings on how people browse their collection of images. These understandings are relevant to grasp when interfaces related to photo collections want to be implemented to be related to the most important tasks at hand. One of the most common and time-consuming activities observed by this study was the triaging or sorting of images. This is done by considering one photo against a collection of others and making decisions about what to keep and what to delete.

This study expanded on the recommendations made by Frohlich et al. emphasizing the design and development of intelligent ways to support search, such as the ability to search by content might be better implemented with tools to help users cluster and view large collections of images. The frequency by which users spent time sorting photos suggests that features to better support these processes may be central to the value of digital imaging tools. Also, in favor of sorting, techniques that allow moving beyond the desktop PC to new forms of input and new types of display may find their place, e.g. touch sensitive displays. Simplicity seemed to be the most important organizing principle for the filing of photos as people archive almost always by time and event and relied heavily in searching and browsing images.

Others studies [14] emphasize the importance of ensuring that the basic features of a system for managing personal photos are efficiency, reliability, and design. Two of the most important features of photoware can be provided very easily: automatically sorting photos in chronological order, and displaying a large number of thumbnails at once. Because people are familiar with their own photos, these facilities are usually enough to allow them to find what they are looking for simply by browsing.

### **2.6 Mobile photoware**

Personal photography is one of the most successful mobile technologies of the last century. Not only has digital photography rapidly supplanted film photography, but also the ever-present camera phones may be ready to replace standalone digital cameras in many of their roles. The ubiquitous camera phone brings new opportunities to media capture, as these devices are always at hand, and increasingly programmable, network-connected and context-aware. Fast and always evolving improvements in image quality may substantially increase camera phones’ potential. Furthermore, the recent appearance

of affordable data plans (internet connectivity) for mobile phones and of popular Internet focused devices such as the Apple iPhone further decrease a major adoption barrier.

Camera phone use is in some respects different from that of other digital cameras. This is partly due to the fact that camera phones are always at hand, and they enable instant communication of pictures. Another difference has been the low quality of cameras in phones. However, as camera phones have better image quality, the combination of camera phones with online sharing and storage systems holds a great amount of promise.

The following describes a set of requirements recommended after a study performed by Ames et al. [15] where emerging practices of mobile photoware are identified across the lifespan of photos in this new imaging environment.

- Mobile photoware should approach a support for integrated capture, archiving, sharing, annotating, viewing and reviewing.
- The device should be able to tie into a variety of existing technologies (online sharing sites, desktop image browsers, etc.) and users practices, because users already have large collections of images into which they want to integrate new images, they already use some sort of software to manage their photography activity, and they already have adopted means of sharing the images such as email or Facebook.
- New technologies need to be compatible and integrate seamlessly with existing and emerging practices and preferences without adding extra steps to modify some sort of property in the images.
- The mobile device should allow for viewing, reviewing and sharing the users' images. "Photo wallet" and "slideshow" features are key in this context.
- Mobile photoware should minimize interruptions and disruption in the user's established photo workflow.
- Image annotation is a useful feature but done in a simplified way, e.g. batch annotations and automatic location metadata.
- The network connected camera phone should allow easy uploading to internet photo sharing and storage services.
- Image sharing is a social interaction. Sharing mechanisms need to be flexible but not cumbersome, offering flexibility in adapting to users' abilities, preferences and technologies of all other users involved in the process.

Olsson et al. [8] expands on these design guidelines by taking into account mobile services for life memory sharing:

1. Support sharing of memories in small groups and communities: people enjoy sharing their memories with those interested or involved, and the possible attention from them. In other words, the traditional face-to-face sharing behavior within small groups of people should be supported.
2. Let the user control the extent of the sharable memory: users must have the power to decide whether to share each content item or not, and the user's filter for deciding about the extent of sharable memories is needed. The main reason for this

is that people usually want to share content that is relevant and interesting to others. And want the control of how good quality and what kind of content they share.

3. Provide features for event-based sharing and management: people capture abundant content in interesting or unique situations and real-life events (parties, happy periods of time, etc.), people usually organize and view contents by events and apply similar editing actions for all the content captured in an event. For this reason, people should be able to manage content in meaningful entities (categories).
4. Provide features for going through the most recent events to support face-to-face sharing: often, several takes are captured from the same object or situation, so choosing the best one(s) right after capturing is required.

## **2.7 Playful photography**

Playful photography is a concept that finds its place within HCI research as a way to engage with the photographic activity from a different perspective than that of efficiency, for example, organizing pictures in the most efficient way. It is something that can be designed for instead of something designed under certain guidelines. However, different photo-related designs may share one or several characteristics of playful photography, if users start to explore and engage in playful ways beyond the designer's intentions.

The following discusses a set of characteristics that are relevant for describing playful photography in general terms [16]:

### **2.7.1 Part of a mundane everyday life**

The designs of these types of applications are intended for non-professional settings of everyday life, and represent activities that can be done as a quick leisure in between other mundane activities. Snapshots can be taken, for example, while waiting for a bus or metro, without having to allocate time for this as a separate activity. In contrast, working with photo albums and organizing a digital photo library is a task that requires some time and extra work to perform.

### **2.7.2 Photography is an engaging activity**

Applications are designed for exploratory activities that are done as enjoyment instead of the performance of some required task. Sometimes these activities could be related to the exploration of digital pictures to engage in social and physical activities, to explore new possibilities for image design, etc.

Also, the capture and sharing of pictures can be done in novel ways and possibly turning the need for photowork changed or reduced. Moreover, activities that are attractive in themselves and detached from more task-oriented activities where the purpose is to "get the work done".

For playful photography applications time is not a critical issue. On the contrary, the situations are characterized by excess time spent with the purpose of spending time in an engaging and playful way.

### **2.7.3 Supporting bodily engagement**

Usually, these are applications that are mobile or beyond the desktop, and they take advantage of physical surroundings, bodily actions, locations, leisure activities to open for playfulness and exploration.

### **2.7.4 Moments of surprise**

The lack of user control these applications usually offer can become part of the fun. The relationship between the process of capturing a picture and the resulting picture is subject to exploration, and this is part of the enjoyment itself.

### **2.7.5 Open for social interaction**

Social interaction around photographs in HCI has often involved viewing of organizing photos in groups of people, for example in a desktop application, which usually implies that one person is controlling and structuring while other people are more passively observing. Playful photography can support different alternatives for social interactions.

### **2.7.6 The purpose of taking picture changes**

Playful photography provides new opportunities for reasons to take pictures. Early reasons for amateur photography were to memorialize a vacation, and more recent reasons for using camera phones include taking a picture to memorize a receipt or send someone a visual reminder. With new technologies and smart phones, the reasons why people take pictures might change. The goals for taking pictures and how to enjoy them is ambiguous and something users actively engage in.

Ubiquitous computing opens up new opportunities for re-establishing and even improving the experiences around photography in this direction. The ubiquitous camera of smart phones, and the many capabilities provided by these devices give range for new activities around this kind of photography leveraging on the mobile aspect now intrinsic to this.

## **2.8 Summary**

This chapter presented several investigations and theories drawn from several observation studies related to photographic practices, user needs, and motivations behind amateur photography. After photography became part of everyday life, the camera became the

vehicle to keep family archives and to establish records of personal experiences. Family albums became the private repositories of all this imagery and family history.

On this domestic iconography paradigm, four key actors were identified that take place in the life cycle of the image: the photograph, the photographer, the subjects in the photograph and the external audience who was not present at the time of the capture of the image. The interactions between these actors illustrate two basic forms of communication around photography:

1. **Reminiscing:** is the action that takes place in solitary, when observing an image and memories come to mind about the events that led to taking the photograph in the first place.
2. **Storytelling:** is a process that takes place in a social setting, when the contents of the image are shared with an audience encouraging a conversation around the events captured in the photograph filling in the in-between scenes of the story behind the photos.

Camera phone use was also explored and it was described how it is replacing compact cameras for its ubiquitous nature, portability, and their ever increasing technical capabilities. With this shift in the way people manage digital photographs, several adjustments are being constantly made to provide solutions to the larger volumes of photographs taken by users. To be able to understand how people manage their libraries, the process of the photography work was described to provide a framework that will guide the design and implementation of applications developed to manage such libraries. On the desktop, this process of managing digital photos consists on these basic steps:

1. **Capture:** performed with a photographic equipment
2. **Edit on camera:** this is the first review, where is done the first selection of images
3. **Download to the computer's hard drive**
4. **File pictures:** the photographs are organized in folders around events
5. **Printing pictures**
6. **Sharing**

The scope of this project focuses on an application for mobile devices to support the storytelling process described above, so this application is situated in the context of playful photography since the end result of the application is to offer an experience of enjoyment to the user, trying to merge the creation of albums (reminiscing) with the sharing of stories sprung from the images (storytelling). In this context, playful photography is taken as an engaging activity open for social interaction, where the purposes of taking photographs are always open for experimentation, same as the storytelling process.

## Chapter 3

### Applications and prototypes

In the previous chapter some explorations around photographic activities were described conceptualizing the motivations behind amateur and family photography, the ubiquitous camera, and describing the process of archiving and sorting through large amounts of images. Additionally, playful photography was considered as a photographic activity worth analyzing and designing for. In this regard, many applications have been developed around photographic activities not only in support of photowork, but also for exploration and playful purposes. In this chapter, several applications will be presented and described to provide a grasp on different approaches to photography and how users engage with the new photographic technologies. A distinction will be made between prototypes for experimentation and research, and applications for commercial use. This list will include desktop applications and mobile applications for smart phones.

#### 3.1 Experimental and research prototypes

##### 3.1.1 FotoFile

*FotoFile* [17] is a desktop application for organizing and managing the digital media of consumers, like photos, video and audio recordings. It offers the users to manually annotate content and to fit the annotation task more naturally into the workflow. Also provides with a number of automated content-based indexing techniques in order to substitute the manual annotation where appropriate.



It provides a narrative structure to help organize the content, turning the organization process into a storytelling activity, and activity more enjoyable than the task of organization, removing the connotation of “work” from the equation.

Whereas with conventional photography, storytelling is typically done using prepared albums and collages, whose structures are fixed, digital photography allows the user to employ more dynamic collections of photos in a storytelling manner. The user can arrange small groups of photos into segments that correspond to single narrative episodes. These segments can be reused in different situations and combined in different ways, depending upon the interaction between storyteller and audience. The model of usage is of two or more people sitting together by a computer, much in the same way that people sit together and go through photo albums. An alternative model of usage is one where the storyteller shares groupings of photos and annotations over the Internet. Small groupings of photos in *FotoFile* are called *scraplets*, which build upon the metaphor of scrapbooks. Figure 3.1 shows a screenshot of *FotoFile* during the creation of an album.

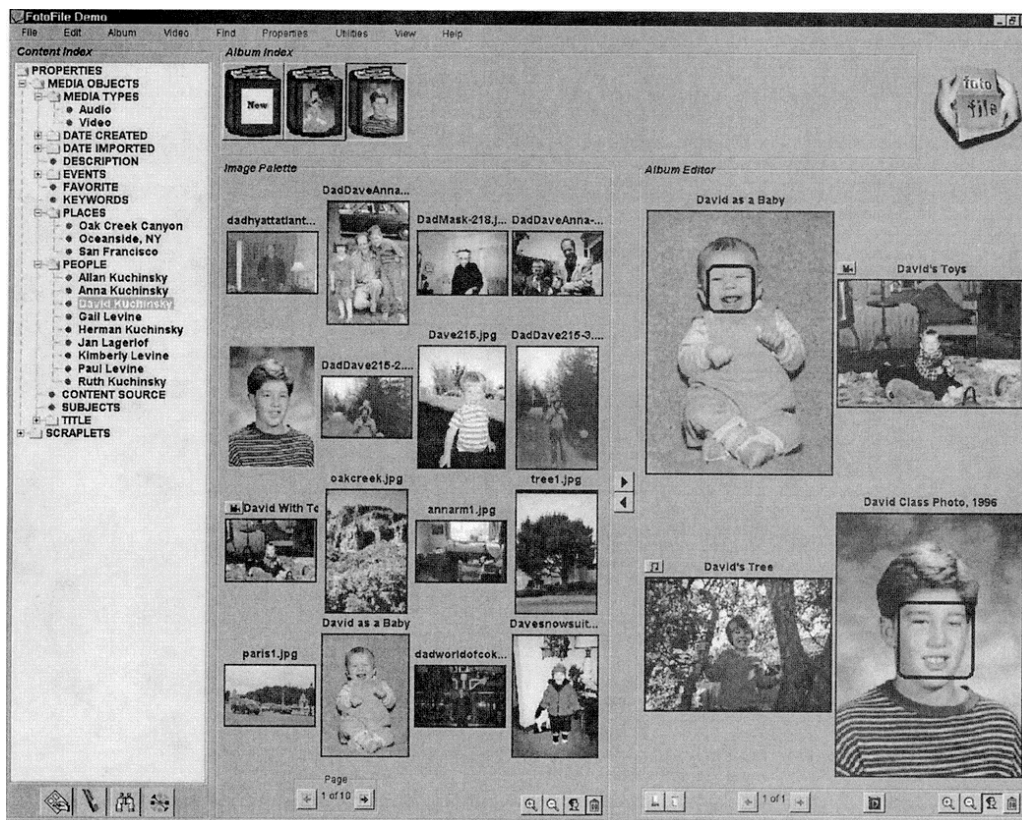


Figure 3.1 Building a multimedia album in *FotoFile*

Automated feature extraction tools enable *FotoFile* to generate some of the automated annotation that can also be manually entered. Some of these features include face detection and recognition.

### 3.1.2 PhotoFinder

By late 1990's many photo collection management software started to proliferate to accommodate the needs of users to manage the large amounts of photographs being taken.

In the year 2000, the *PhotoFinder* [18] prototype was implemented to assist non-technical users to search and browse easily their photo collections.

The interface was implemented using direct manipulation with a visual representation of the search space. To simplify the operations of searching and browsing, pointing and selecting was preferred over typing. It has a three-window scheme: a search tool window, a thumbnail browser window, a detailed user window.

*PhotoFinder* allows users to search a library with several collections. Users start with the collections browser where they select a collection for more detailed study. The search tool has a series of tabbed panels of dialog boxes for setting query attributes. There are two display modes for the thumbnail browser window, sequential display and scattered display. Zooming is also provided for better use of display space and ease of navigation. Point and click is allowed to select a specific picture or several pictures in the thumbnail browser window. The detailed viewer window displays the full sized picture selected from thumbnail browser and it provides input boxes to annotate single pictures. Figure 3.2 presents a screenshot of *PhotoFinder*'s interface.

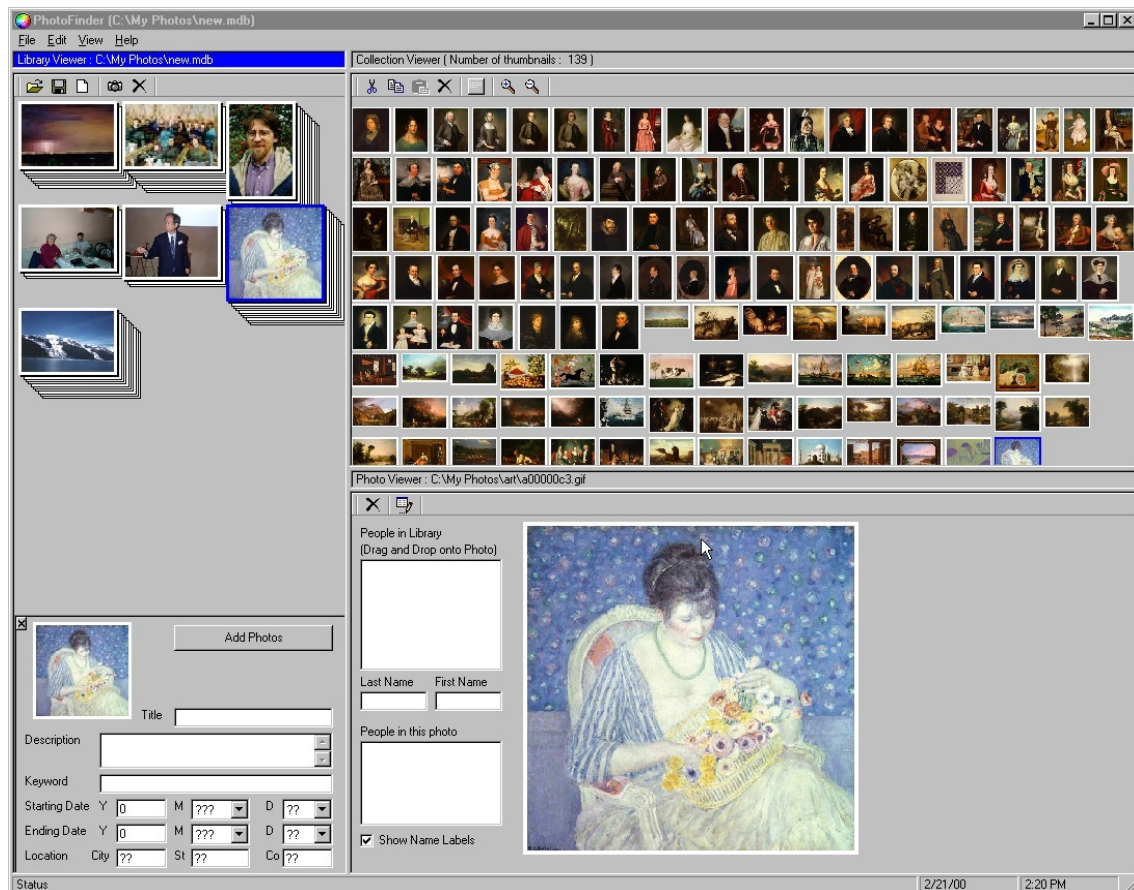


Figure 3.2 A screenshot of *PhotoFinder*'s interface

### 3.1.3 PhotoMesa

Later on, a prototype named *PhotoMesa* was implemented. *PhotoMesa* [19] allows the user to view multiple directories of images in a zoomable environment, and uses several

navigation mechanisms to move through the image space. It clusters the images by metadata available from the file system that is not required to be introduced by the user. Figure 3.3 presents a screenshot when a directory is opened in *PhotoMesa*. Here a space is filled with the photos available in that directory using a quantum treemap to create one rectangular group for each directory. Even though a hierarchical directory structure is read, the images are displayed in a flattened manner, not hierarchical, because users are interested in groups of photos and not in the directory structure of the groups.

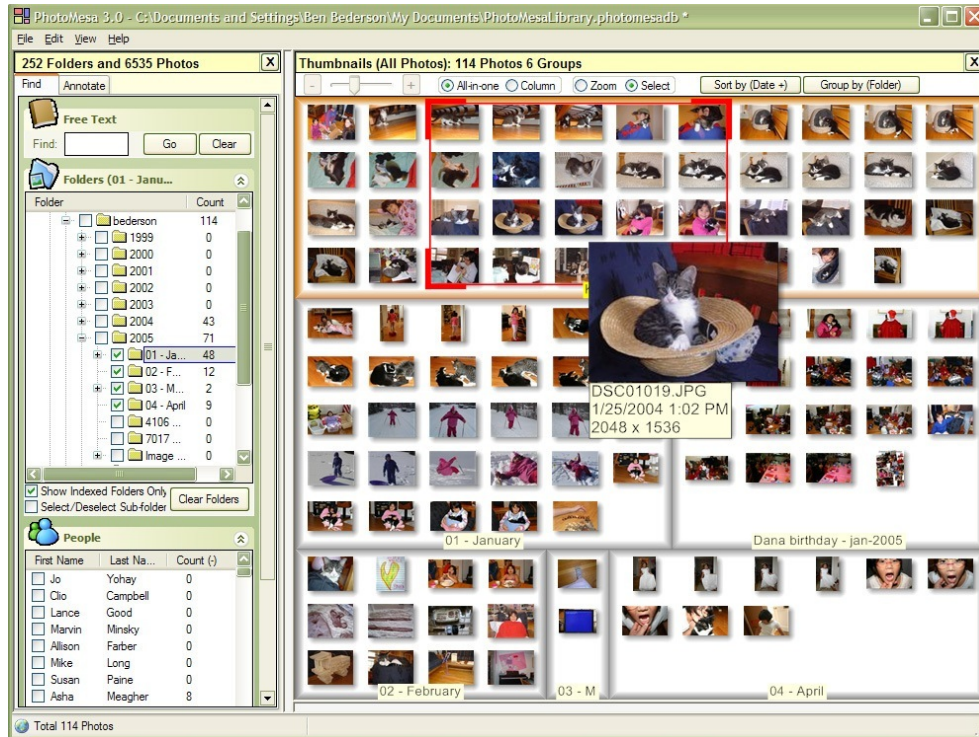


Figure 3.3 *PhotoMesa*'s browsing interface

As the user moves the mouse, the group the pointer is over is highlighted. Then when the user clicks, the view is smoothly zoomed into that group. *PhotoMesa* computes multiple sized thumbnails for each image and loads the appropriate one, thus maintaining good performance even with a large number of images.

### 3.1.4 Calendar Browser

This prototype was developed to conduct user tests to assess user's preferences on browsing methods of large digital libraries. The *Calendar Browser* [20] takes advantage of photo time stamps by using the date and time information recorded when the camera equipment took the photo. This data is encoded into the image file so applications have access to it.

This application offers an extremely simple interface that uses date/time stamps to enable ascending browsing and summarization. At any given time the user is viewing images from one single time. For example, at a "one-year granularity", all images in the display panel will have been taken during the same year.

### 3.1.5 Shoebox

*Shoebox* [21] is an application for organizing, annotating, indexing, searching, and browsing collections of digital images. It was developed by AT&T Laboratories as a part of a research in multimedia information retrieval, and is a Windows interface on top of an object-oriented database designed for multimedia indexing.

Like commercial systems, *Shoebox* provides a conventional thumbnail-based browsing tool for organizing, labeling and viewing photos. As a research prototype, it has some additional features distinguishing it from other systems:

- An audio capability used to speak about the users photos, and attach these comments to individual images or groups of images. The annotations are stored for playback and can be automatically transcribed.
- Image analysis and indexing tools that allows the user to search for photos based on their visual content. Users can then select a photo and search for other photos visually similar to it, or they can highlight one or more regions within a photo and search for other photos containing similar regions.

### 3.1.6 StoryTrack

*StoryTrack* [22] was a prototype device developed around an organizational metaphor of stories, using chronological ordering and groups created by the users, in the same manner as folders and directories in a file system. This was not a desktop application, instead it was a portable device created before mobile systems were of widespread usage. Its main purpose is to support storytelling with digital photos in the same manner people use print photos to tell their family or personal stories.

This prototype is different from the *FotoFile* [17] system in that it doesn't employ any sophisticated browsing and searching mechanisms by the use of categories such as people, places and events. *StoryTrack* instead uses simpler search strategies, like scanning through photography albums chronologically. There are two kinds of stories represented in the system prototype: imported stories correspond to a set of downloaded photos from one session, and authored stories that correspond to a selection of photos ordered by the user. Figure 3.4 presents a photograph of the *StoryTrack* device while being manipulated by users.



Figure 3.4 *StoryTrack* device

### 3.1.7 Living Memory Box

The *Living Memory Box* project [23] was developed to address the issues of collection, archival and annotation of memories of the life of a family. Figure 3.5 shows a prototype of the system composed of three pieces: a central display/storage device (“the Box”), one or more portable personal recording devices, the interface, and the network.



Figure 3.5 The physical model of the *Living Memory Box* prototype

The box is the receiver of several digital devices to capture and access the information contained in them. The device was designed to convey the metaphor of a box containing the memories and artifacts that want to be preserved by the family.

This prototype showed several key findings in the design and development of systems for memory recollection:

- The annotation and organization tasks of the material should be turned into a time of personal expression in the interaction design.
- The interaction should be brought away from the PC, so it doesn't feel too much like regular work.
- The storytelling component should be encouraged at any point.

### 3.1.8 MobiPicture

*MobiPicture* [24] is a prototype system developed by Microsoft Research Asia to help understand the browsing of pictures on mobile devices. It employs a thumbnail view for ease of browsing on the small screen of the device, zooming and scrolling. These features were developed based on an image attention model generated automatically from the content. An attention model is defined as a set of attention objects; these attention objects carry information with the author's intention and engage the user's attention. Figure 3.6 presents two screenshots of the *MobiPicture* prototype for mobile devices. The screenshot from the left shows the thumbnail view when the user is browsing the photos. The screenshot from the right shows an image once is selected.

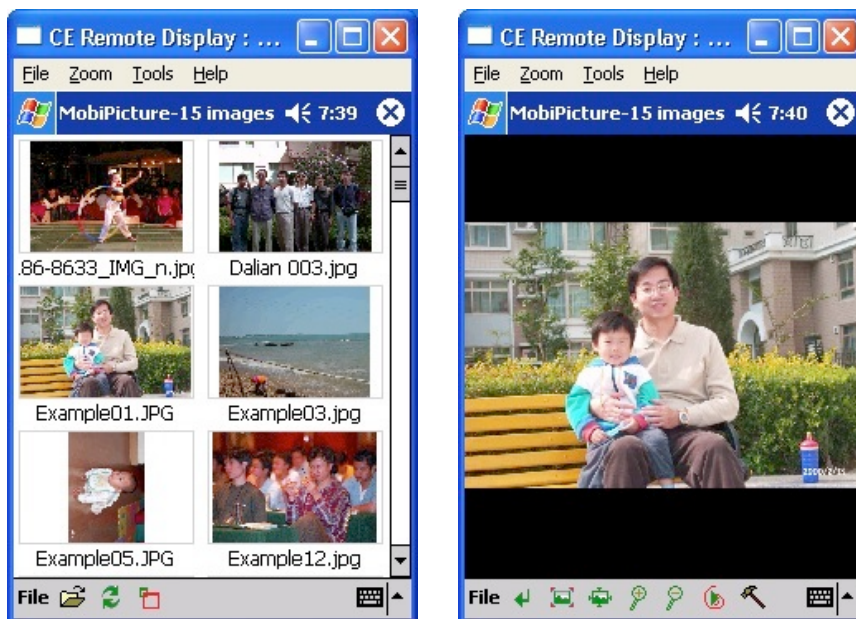


Figure 3.6 Thumbnail view (left). Fit-to window view (right)

### 3.1.9 Flipper

*Flipper* [25] is an experimental photo sharing system developed to study the photo sharing behavior and social presence of the users. Figure 3.7 shows the minimal set of features provided by the application's prototype, supports photo sharing in a social exchange by sharing within friends' lists based groups, and it supports integration between the desktop and mobile devices.



Figure 3.7 Buddy list + image view (left), and Image expanded view (right)

This prototype showed that people will want to have multiple groups to share photos with, but also the issue of privacy arose because sharing personal events should be with a select group of people, so the need to select subgroups became necessary. Also, the sharing of photos allowed certain kind of communication between the group members since the photos turned into an update of events.

### 3.1.10 Baseline browser and Timeline browser

Exploring the PDA as a platform for a photo browser application, a group of researchers from Stanford University developed two browsers [26] focusing only in the interface issues and not in the transfer of photos to the device, using time as an organizational principle for PDAs in the same manner as the *Calendar browser* did for the desktop.

Figure 3.8 presents the two modes the *Baseline browser* works with. For *Baseline Manual* the user applies their own organizational structure similar to a folder-based structure. In *Baseline Automatic* mode the system generates the organizational structure for the user.

The opening screen lists all the folders, and instead of showing a folder icon it shows the folder as a button control displaying 3 sample photos and the number of subfolders and images contained in that folder.



Figure 3.8 *Baseline browser* interface with folder browsing behavior

The *Timeline Browser* relies on a hierarchical organization structure (shown in Figure 3.9). The concept behind it is to enhance the role of time to browse the collection of images; it reduces the amount of images shown in the screen and instead uses that space to provide time orientation without overloading the screen with thumbnails.



Figure 3.9 *Timeline browser* interface in year and month view

This study suggested that automatically generated photo organizations can compete with user generated structures with traditional interfaces if they are coupled with an appropriate interface. But more importantly, this study demonstrated that manual organization is a task that most users dislike, showing that with the new capabilities of mobile devices, there are several avenues for automating photo collections based on the photos' metadata.



### 3.1.11 Pocket Photomesa

*Pocket PhotoMesa* [27] was implemented based on the Treemaps technology implemented in *PhotoMesa* [19], the experimental image browser application for the desktop. It was implemented to experiment with the design of an image browser that eliminated the need of a scrollbar, very typical in devices with small screens, to suppress the need of finely tuned pointing skills. Figure 3.10 shows the interface where the Treemaps are implemented to layout image thumbnails, and Zoomable User Interfaces are achieved by the use of icons placed at the bottom of the screen.



Figure 3.10 Three views of *Pocket PhotoMesa* at different zoom levels

The major observation drawn from this study had to do with the users' behavior: when given a specific image to find, users tend to take advantage of the screen layout to reduce interaction steps whenever possible and scan the screen for color intensity or a characteristic pattern, narrowing the visual search to one or more groups that had relevant color themes.

### 3.1.12 PhotoField

In order to support the sharing of stories with photographs, a group of researchers from the University of Tokyo developed a framework and implemented it in a software named *PhotoField* [28]. The framework for spacial slideshows maps personal photo collections and constructs them into stories such as route guides, sightseeing guides, historical topics, fieldwork records, personal diaries, etc. Each story of a spacial slideshow is made out of a sequence of mapped photographs using several mathematical methods, and is presented as synchronized animations of a map and an enhanced photo slideshow.

Figure 3.11 presents two screenshots of the software *PhotoField*. This application enables users to organize and share photo collections by using a map. With this software is possible to create a spatial slideshow animation that visualizes the progression of the story as movements from photo to photo in a three-dimensional space.



Figure 3.11 Spatial Slideshow viewer

### 3.1.13 Co-present photo sharing on mobile devices

Trying to further the advancements in photo sharing in different ways with mobile devices, a prototype application was developed to allow users to share photos with other co-present users by synchronizing the display on multiple mobile devices [29]. Figure 3.12 explains how the interface of the application was based on the Windows mobile standard photo viewing application. This experiment was aimed to determine what social behaviors an application of this kind can encourage (either story driven behaviors or entertainment behaviors), and what are the implications of control policies over the social experience.

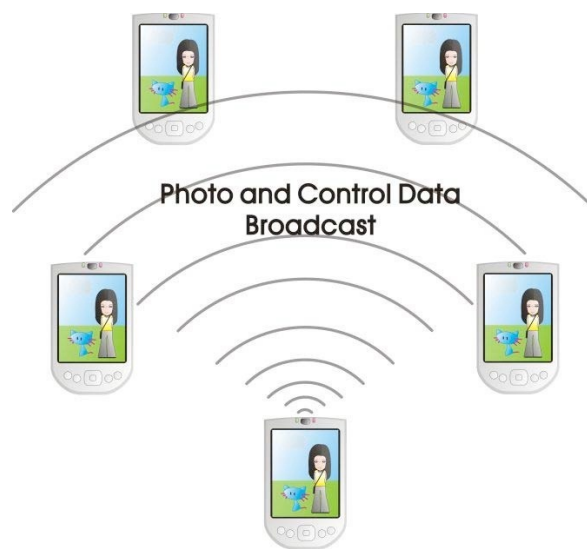


Figure 3.12 Illustration of how devices communicate

The method of communicating between devices was through IP multicasting using the built-in WiFi of the device. Using IP multicasting several users can log in to the same multicast IP and are able to synchronize with the show. This study concluded that applications of this nature should implement a locking mechanism in order to support the storytelling; otherwise any user can take control of the show interrupting the storytelling session of the previous user.

### **3.1.14 Bookmarkr**

*Boorkmarkr* [30] was a system developed to bridge the gap between the printed photo and its digital clone by employing a mobile camera phone. It allows the interaction with printed photos in a similar way as interacting with digital photos by using a point-and-shoot metaphor. It works by taking a photo of an image in a photobook with a camera phone, then this image is transmitted to a photobook server that accesses a photo repository containing all digital photos, employing digital analysis techniques the photobook server retrieves the photographed picture by matching the image taken by the mobile phone with the digital photo stored in the repository. The photo is sent back to the user establishing the digital-physical match of the original photo of the photobook.

### **3.1.15 Mobile Multimedia Presentation Editor**

To contribute with an editor interface for authoring rich and expressive audio-visual multimedia presentations with mobile devices the *Mobile Multimedia Presentation Editor* [31] was developed. With this prototype the presentations can be stored locally in the device itself, or shared through any sharing mechanism like MMS, e-mail, screenings on the TV display, Bluetooth and Internet sharing.

The most important contribution made by this prototype was the development of an interface for multimedia authoring for mobile users based on the constraints of the reduced screen size and the restricted input output capabilities of mobile devices, implementing an user centered approach focused on four key principles: flexibility, awareness of the task context, expressiveness, and personalization.

The flexibility principle has to do with the idea that the end result often changes during the composition process. The principle of awareness of the task context relates to the flexibility principle because when composing a more complex item, that involves more than one page of presentation, the user needs to be aware of the task they are performing and the part of the page of the presentation they are in. The expressiveness principle has to do with the elegance and the image quality of the message, as it needs to convey the idea the user has in mind. The personalization principle requires that presentation editors provide a rich set of editing features and they should support editing of all the elements in the presentation.

### 3.1.16 Zurfer

*Zurfer* [32] is a mobile application prototype designed to enable comprehensive photo browsing on the go. It was regarded as a first step towards considering the mobile phone on everyone's pocket to become a future 'photo wallet', providing access to not only the user's photos but to all the media in the world.

*Zurfer* uses Flickr as a backend and is able to support tasks such as entertainment (browsing photos for fun), social contact (looking at friend's latest photos), and access to the user's own photo collection. The main design goal with *Zurfer* was to enable easy access to the most important dimensions of Flickr, and for an intuitive and playful interaction with the basic content. Figure 3.13 shows the four-channel metaphor used to allow the user to quickly browse photos in the Flickr dimensions using the 4-way navigation key of the mobile device.



Figure 3.13 *Zurfer* screenshots: channel view (left), full screen view (right)

This research provided several findings about mobile photo browser use, being the most relevant the identity presentation. Users from the study group revealed that the photos shared co-presently can be used to describe the user to other people. This type of usage extends the idea of the traditional "photo wallet" of printed photos that many people carry around with them. An important design implication derived from the implementation of *Zurfer* involves the use of the device's full screen resolution to enable slideshows of the photo content available through the application, and to facilitate users the assembly and access a "Photo Wallet" of their favorite photos or albums.

### 3.1.17 PhotoArcs

*PhotoArcs* [33] is a ludic tool to enable photographers to organize their photos on an arc, according to a timeline that evokes context and memory. Additionally, they can share and add narratives to their online photograph collections in a way that mimics face-to-face sharing patterns while also leveraging many of the benefits of the digital medium.

Using *PhotoArcs*, users can organize their pictures and their friends' pictures into linear arcs and add textual narratives to individual photographs or groups of photos. Users can also construct arcs with friends, view the ways in which their arcs intersect with others friends' arcs, create and view multiple arcs in order to have different versions of a particular narrative for different audiences, and comment on others' arcs. These interactions introduce a nonlinear element by providing jumping off points or tangents from their own arcs. A timeline view allows users to get an overview of their own arcs and to view the arcs created by their friends. Figure 3.14 illustrates several intersecting arcs.

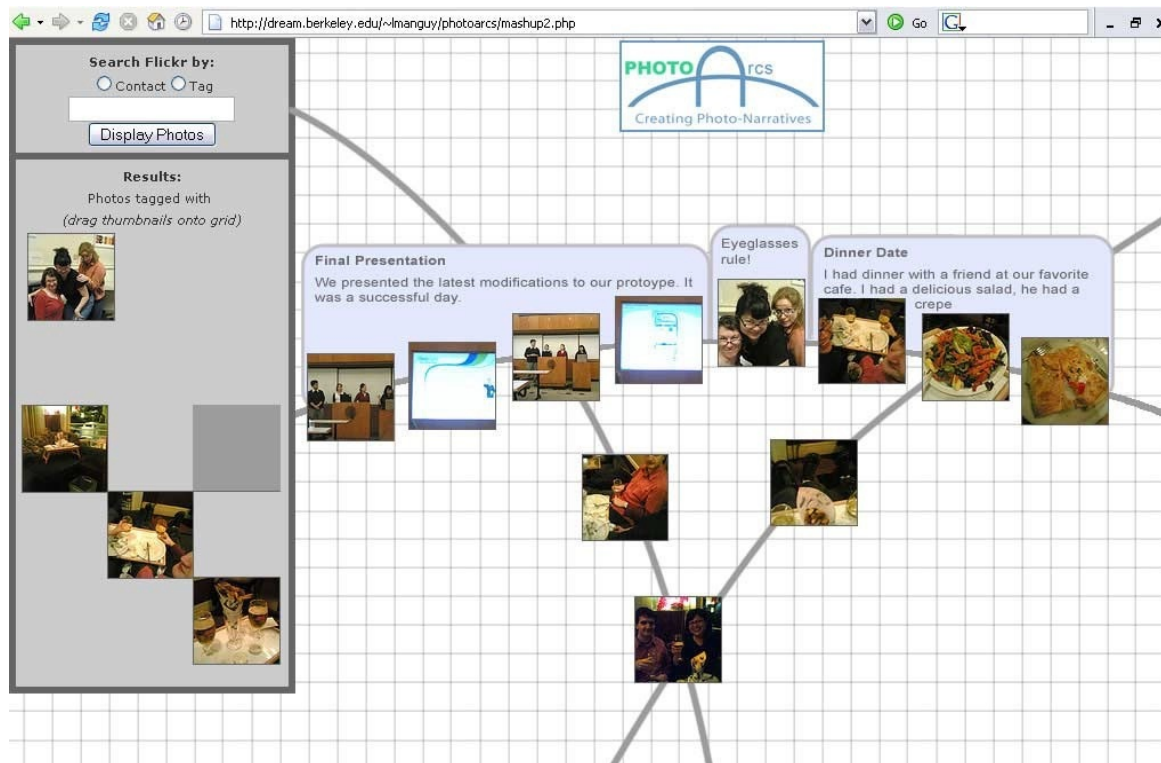


Figure 3.14 Textboxes and intersecting *PhotoArcs*

While there are many tools for photo-organization, only a few have used non-grid timelines for organization and few have focused on photo-sharing in particular. *PhotoArcs* introduces a number of new elements to make remote sharing easier and more engaging, and is more focused on photo-sharing and narrative creation rather than personal photo organization.

### 3.1.18 Columbus

*Columbus* [34] is a playful application designed to explore physically the world via geo-tagged photos. By using the GPS system of location aware devices, the user must go to the physical location to discover it. The main objective of the application is to allow users and groups to discover and explore the world that surrounds them in a fun and exciting way.

The aim of *Columbus* is to bring back a sense of discovering (or re-discovering) the world to the user, including the familiar places that are passed by daily. The concept is inspired by adventurous journeys in the old times, or even computer games, where notions like “here be dragons” used to indicate unexplored territories. The exploration of photos in *Columbus* takes place in the physical world where the user must physically go to a place to be able to “discover” it to get access to already existing geo-tagged pictures. Figure 3.15 presents the map the user must explore in order to discover new places.

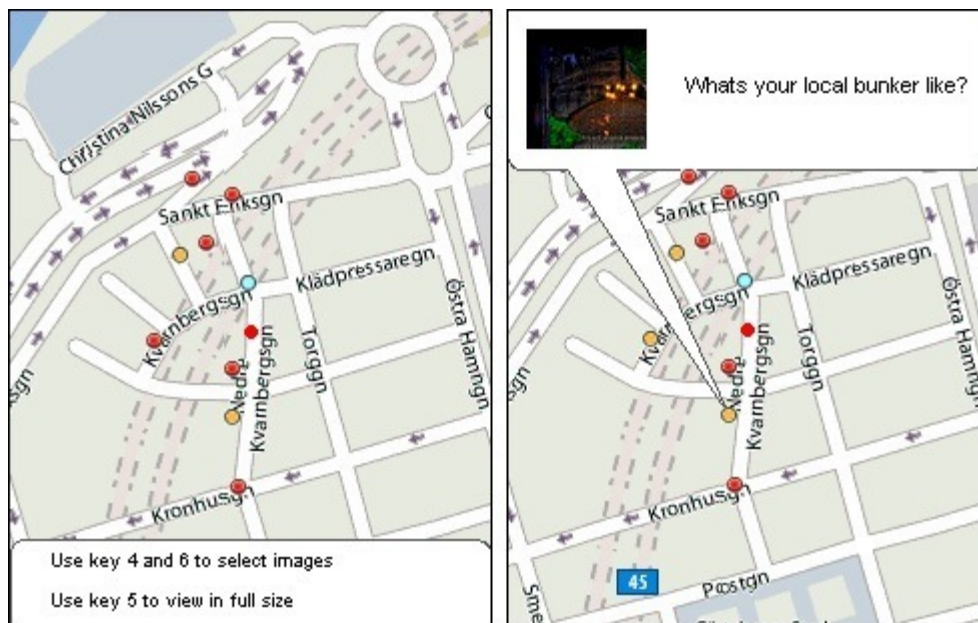


Figure 3.15 Two views of the explore mode in *Columbus*

## 3.2 Commercial applications

There are many commercial applications for the desktop and mobile devices developed to manage, organize and edit users' photo collections. The most popular ones are described as follows.

### 3.2.1 Picasa

Google's Picasa<sup>6</sup> is a free desktop application distributed by Google Inc<sup>7</sup>. This application is an image organizer and viewer, it also supports doing minor editing on the photographs and uploads to the Picasa photo-sharing website. This application is offered from a free download off the web, and it works on the Windows and Mac OS X platforms.

Among its features, *Picasa* supports image organization, tagging, facial recognition, geotagging through the image's Exif metadata, and building collections. It also offers some basic photo editing functions like color enhancement, red eye reduction and cropping. Additionally, it includes other features like slideshows and image timelines. Figure 3.16 shows the main interface of the *Picasa* application.

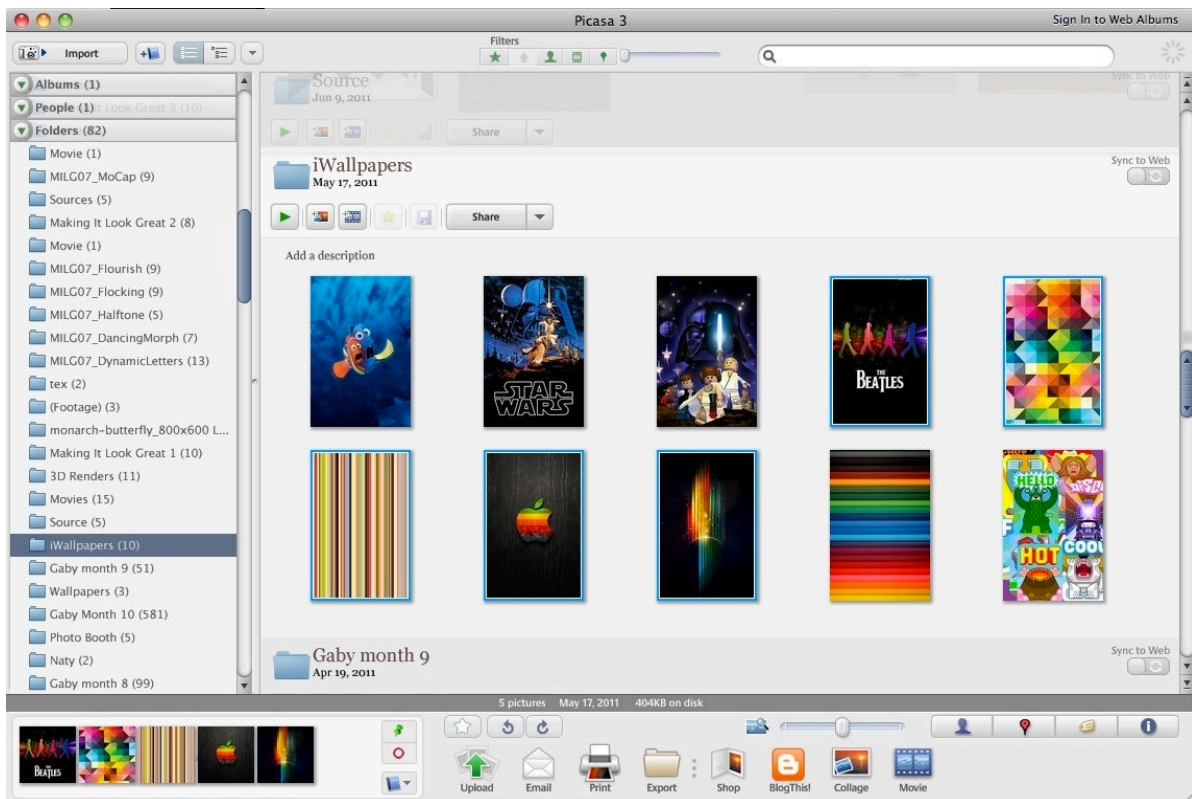


Figure 3.16 *Picasa* image browser

<sup>6</sup> <http://picasa.google.com>

<sup>7</sup> <http://www.google.com>

### 3.2.2 iPhoto

*iPhoto*<sup>8</sup> is a digital photograph manipulation software developed by Apple Inc. and released with every Apple computer as part of their *iLife*<sup>9</sup> suite of digital management applications. It is very similar to *Picasa* because it offers most of the same features: it imports photographs from several kinds of devices like digital cameras, scanners, CDs. After the photos are imported, *iPhoto* is able to organize them into events albums. Later in the process, individual photos can be edited with some basic corrections. It also supports sharing the photos by creating slideshows, prints and is also able to upload them to various photo sharing websites like Facebook and Flickr.

The interfaces of *iPhoto* and *Picasa* are very similar in organization, user interaction and functionality. Figure 3.17 shows the interface of the main screen, where the similarities between the two are easily appreciated.



Figure 3.17 *iPhoto*'s interface

### 3.2.3 ACDSee

*ACDSee*<sup>10</sup> is the most popular image organizer and viewer for the Microsoft Windows platform, and is developed by ACD Systems. Figure 3.18 shows its basic interface. Its main feature includes a tree view of the file structure for navigation with thumbnail images of the selected folder, and a preview of a selected image. It also offers some basic image editing capabilities.

<sup>8</sup> <http://www.apple.com/ilife/iphoto/>

<sup>9</sup> <http://www.apple.com/ilife/>

<sup>10</sup> <http://www.acdsee.com>



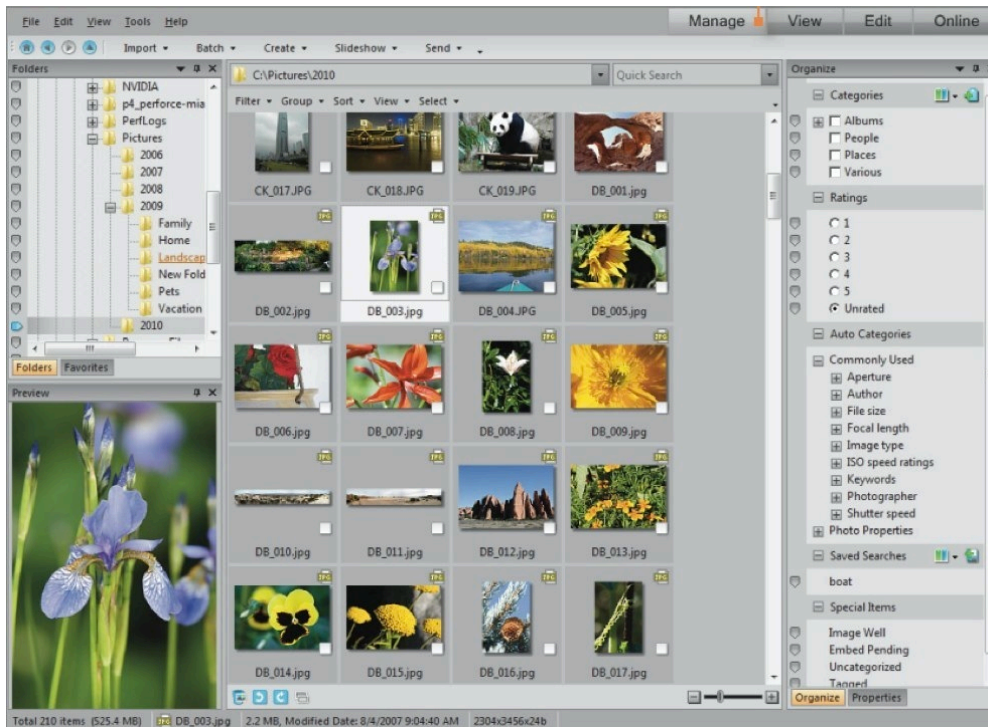


Figure 3.18 *ACDSee* image browser

### 3.2.4 Instagram

*Instagram* [35] is a free photo sharing application designed to use on Apple iOS<sup>11</sup> devices developed by Kevin Systrom and Yosyp Shvab. The application, which is compatible with any iPhone or iPod Touch running iOS 3.1.2 or above, allows users to share their photos after applying a variety of effects or filters. Users can share photos through the *Instagram* app or using a variety of other social networking products like Facebook, Twitter<sup>12</sup>, Foursquare<sup>13</sup>, and Posterous<sup>14</sup>.

*Instagram* is inspired by Kodak Instamatic and Polaroid cameras, because it reformats photos into a square shape. This is in contrast to the 2:3 aspect ratio normally used by the iOS device cameras. Figure 3.19 presents *Instagram*'s basic interface where the user can choose the pre-designed filters located at the bottom of the screen to apply to the images to give them a special look.

This application lends itself to several uses, because it supports experimentation with the images and the social aspects of photography, and is part of the “retro” trend in photography that arose with the popularity of the iPhone since the year 2007.

<sup>11</sup> <http://www.apple.com/iphone/ios4/>

<sup>12</sup> <http://twitter.com>

<sup>13</sup> <http://foursquare.com>

<sup>14</sup> <http://posterous.com>

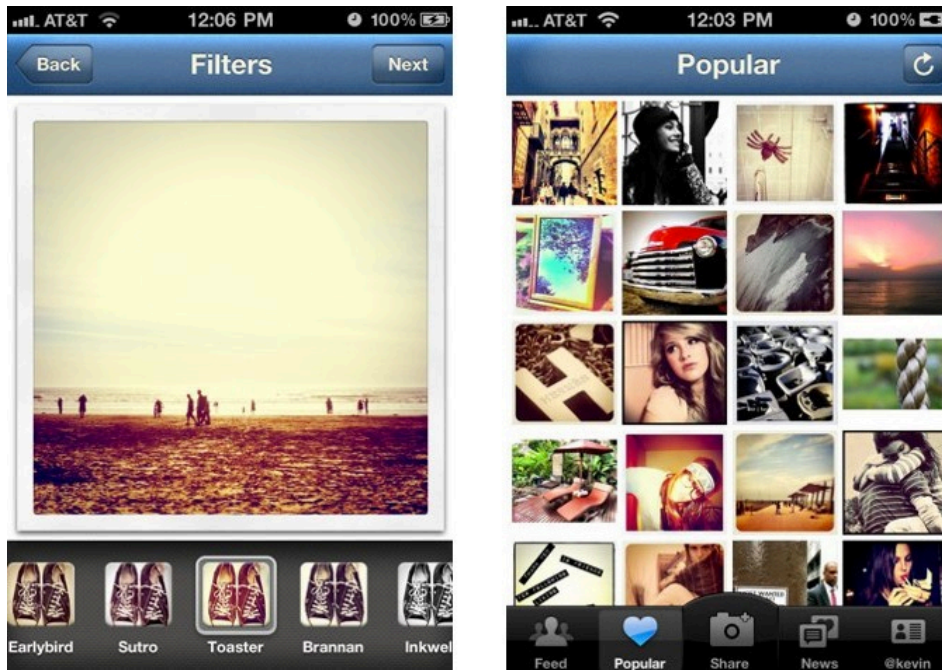


Figure 3.19 *Instagram* application for iOS

### 3.2.5 Hipstamatic

*Hipstamatic* [36] is a digital photography application for the Apple iPhone. It uses the iPhone's camera to allow the user to shoot square photographs, to which it applies a number of software filters in order to make the images look as though they were taken with an antique film camera. The user can choose among a number of effects that are presented in the application as "lenses", "films" and "flashes" (Figure 3.20). Several of these are included with the application, while others need to be purchased separately. *Hipstamatic* is part of a "retro" trend in photography, which has seen a rise in the popularity of cheap and technically obsolete analog cameras (such as Lomography and Polaroid instant cameras), as well as software filters and smartphone software that emulate such cameras. It includes social networking features to facilitate the exchange of photos via the Internet.



Figure 3.20 *Hipstamatic* application for iOS

### 3.3 Summary

This chapter presented some of the most notable prototypes and commercial applications developed in the realm of digital photography. After reviewing the main functionalities these applications offer, they can be categorized according to such functionalities:

1. Desktop applications
  - a. For organization and photo management
  - b. For playful engagements
2. Mobile applications
  - a. For photo browsing
  - b. For photo editing
  - c. For playful engagements

**Desktop commercial applications** are designed to address user needs of organization and photo editing, but their use has been extended to playful applications used for multimedia experimentation, because other creative uses can be attributed to the photographs in the development of photo narratives, *e.g.* photomosaics, photo slideshows. Applications like Picasa and iPhoto offer such functionalities.

The **research prototypes** showed several approaches to managing large collections of digital photographs, concluding that tree based folder structures organized around events correspond to the metaphor the users are most familiar with. When taking these findings into mobile platforms, where small screen devices present challenges in the ways photographs should be presented, users tend to rely on organizational structures automatically generated by the application, often by date, information, and tend to dislike manually created collections.

**Prototypes for ludic engagement** use the photographs to experiment around other uses that can be attributed to the images, incorporating sound, location, and an encouragement to building narratives around photographs. These are interesting aspects to explore and to build interfaces around, especially with the advent of mobile technologies and the new forms of interactions presented by multi touch devices.

After examining the applications ecosystem currently developed for the mobile platforms, we noted that the most popular applications are used to process the photographs with special effects, and the most popular way of sharing the images is via uploads to social networking sites. In the mobile space is where attempts should be made to bring some of the enjoyment back to the album creation process with the photographs taken with the device itself, often regarded as a tedious process, and to encourage co-present sharing. Even more, with the robustness of current mobile operating systems, the

mobile space still offers many possibilities to build photography applications to explore new ways of creating content with photographs.

Table 3.1 presents a functionality analysis each of the applications support. Here we are able to notice that most modern applications are designed with two main purposes in mind: **sharing, and storytelling.**

**Table 3.1 Functionality analysis**

	Desktop	Mobile	Prototype	Commercial	Time	Location	Face Detection	Organizational	Sharing	Storytelling
<b>FotoFile</b>	x		x		x		x	x	x	x
<b>PhotoFinder</b>	x		x					x		
<b>PhotoMesa</b>	x		x		x			x		
<b>Calendar Browser</b>	x		x		x			x		
<b>Shoebox</b>	x		x		x			x		
<b>StoryTrack</b>		x	x		x			x		x
<b>Living Memory Box</b>			x							x
<b>MobiPicture</b>		x	x							
<b>Flipper</b>		x	x						x	
<b>Baseline Browser</b>		x	x					x		
<b>Timeline Browser</b>		x	x		x			x		
<b>Pocket Photomesa</b>		x	x					x		
<b>PhotoField</b>	x		x			x			x	x
<b>Co-present photo sharing</b>		x	x						x	x
<b>Bookmarkr</b>		x	x							
<b>M. M. Presentation Editor</b>		x	x						x	x
<b>Zurfer</b>		x	x						x	
<b>PhotoArcs</b>	x		x		x				x	x
<b>Columbus</b>		x	x			x			x	x
<b>Picasa</b>	x			x	x	x	x	x	x	x
<b>iPhoto</b>	x			x	x	x	x	x	x	x
<b>ACDSee</b>	x			x	x	x		x		
<b>Instagram</b>		x		x	x	x			x	x
<b>Hipstamatic</b>		x		x					x	x

## Chapter 4

### Interface requirements

According to the state of the art review, at the most basic level photo management has to do with organizing photos into albums or collections to share with others. The sharing activity consists in people constructing narratives or stories around those photographs and having a conversation around those stories with a listener. One key advantage of co-present sharing is the flexibility in the storytelling the user has when displaying the photos to another person. The person who shares can adapt the story around the images according to the other recipient's reactions and comments.

The current model for interfaces on mobile devices employed by manufacturers separates the organization of the photographs from the device and leaves those activities to be carried out solely on the desktop. By employing mobile devices users have to synchronize their photo collections with the desktop computer, extract those photos, and organize them with a photo management software of choice. Furthermore, the literature shows that mobile interactions models are still in their infancy and most interaction research around photographic software has been developed more around the desktop experience.

#### 4.1 Market research

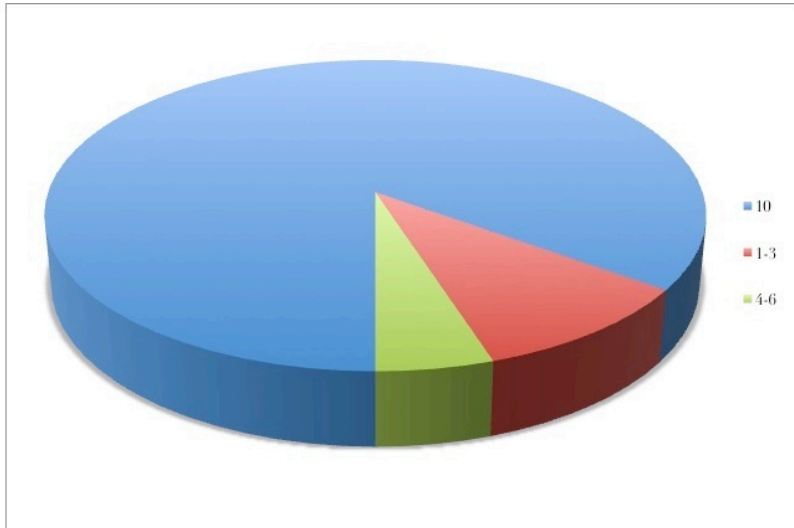
Before the design and the interaction with the interface was conceived a small market research was conducted to establish an overall level of digital photography experience possessed by the target audience, and to determine the level of comfort they might have with mobile devices/smart phones. This study defined certain expectations to have in terms of the reception an application of this nature would have with the users, and also

delineated certain interaction design guidelines to create metaphors and conceptual models accessible to users.

The market research consisted of an online questionnaire (see Appendix A) sent via e-mail to a random sample of 20 people. The data collected from this study are as follows:

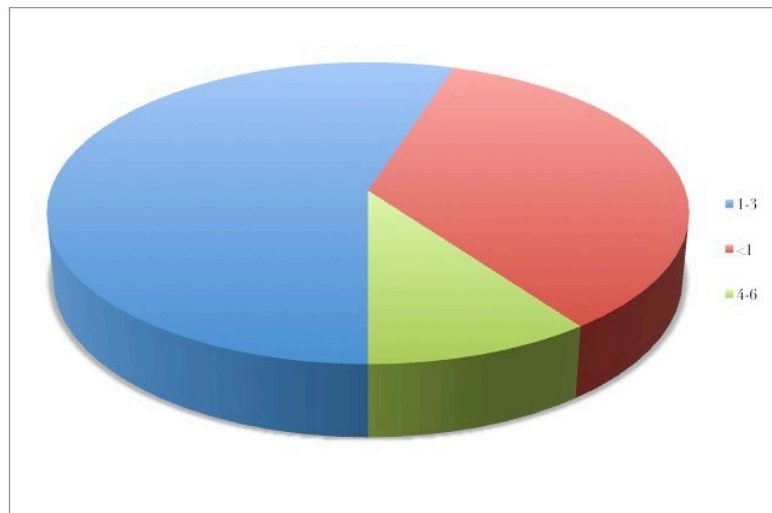
1. The sample was composed of 55% female and 45% male participants
2. 65% of the participants were between 26-35 years of age. 25% were between 18-25 years old, and 10% of the sample was 45 or older.
3. 60% of the sample were Masters degree students, 30% were working professionals and 10% were undergraduate students.
4. 90% of the participants were using computers for more than 10 years, 5% were using them between 7-9 years, and the remaining 5% were using them from 4-6 years. This indicates that people are very familiar with computers, this fact also leads to assume that people are used to graphical user interfaces and the folder structure metaphor.
5. 90% of the sample uses smart phones. This also indicates a high level of familiarity with mobile technologies and familiarity with applications that translate the desktop experience into small screen devices.
6. 100% of the participants own a digital camera, and 95% of them have been using them for more than 2 years. Only 5% of the sample has less than 2 years of digital photography experience.
7. 90% of the participants have taken photographs with their mobile device. This means they are very familiar with this kind of photography that relies in the use of the device that is always at hand in a pocket or in a purse.
8. 75% of the participants have never used a photo management application for their mobile device. This leads to assume that probably the level of familiarity with applications for photography with mobile devices would have to rely heavily on the metaphors already established on the desktop to organize photographs, and more novel features, like the one on the *free-story mode* might offer a level of resistance at first.
9. 60% of the participants would be willing to print the photographs taken with their mobile device. The “Photo Wallet” application might become an alternative to the print-out photo, so instead of printing the photos, the user might use the application to play this role in their general photography use.

Figure 4.1 illustrates how long (in years) the sample participants have been using mobile devices and/or cell phones, 85% have used a cell phone for more than 10 years. This demonstrates that participants are very familiar with mobile technologies and is customary for them to have a mobile device with them. On the other hand, this metric does not indicate the familiarity with current smartphone technology, or a grasp on how to interact with touch based devices since this kind of devices have grown in popularity during the last five years.



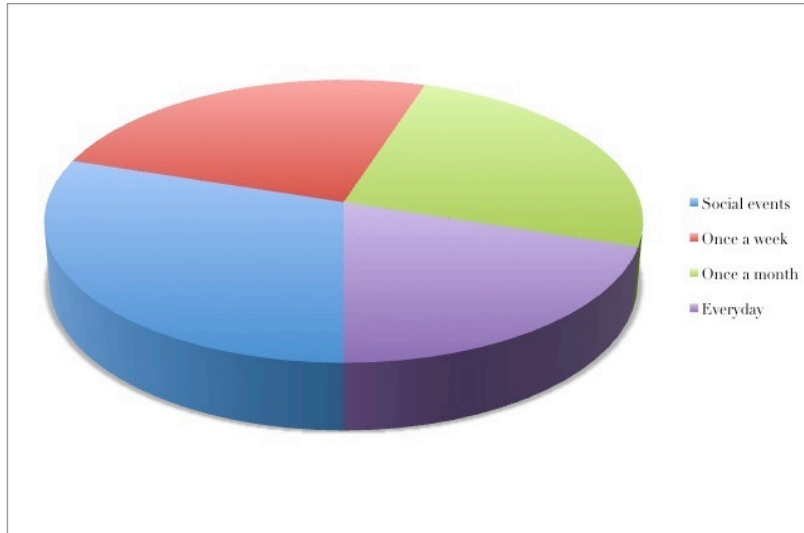
**Figure 4.1 People usage of mobile devices (in years)**

Figure 4.2 shows, in average, how many hours a day the sample participants use a mobile device. 55% of the participants use their mobile device from 1-3 hours, this could mean the device is some sort of smart phone and they use several capabilities of it (e-mail, social networks, etc.). 10% use the device from 4 to 6 hours, which means they use it for more things, like gaming or surfing the web, this requires more time and involves other playful uses. 35% of the sample uses the device less than 1 hour a day, which means they only use it to make calls or to check e-mail, not taking advantage of all the functionality the device has to offer.



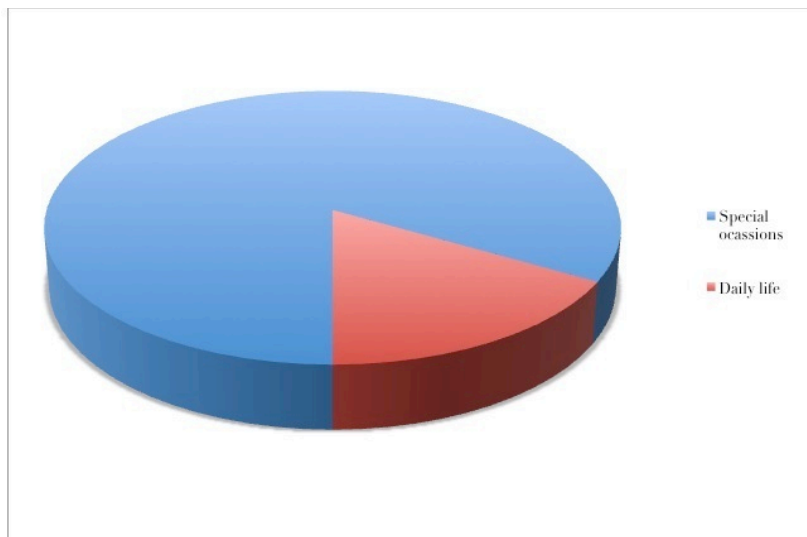
**Figure 4.2 People usage of mobile devices during one day (in hours)**

When studying their use of digital photography, Figure 4.3 shows that 30% of the participants only use their digital camera to take photos on social events, 25% use it one a week, 25% use it once a month, and only 20% use it on their everyday life. This demonstrates what the state of the art review stated that people mostly take photographs of special events, trips and any other activity deemed to be remembered.



**Figure 4.3 Frequency people take photographs**

Figure 4.4 supports the idea of the previous statement, illustrating the occasions people take photographs, showing that special occasions, trips and holidays is when people use their camera the most. 20% of people use it to capture their everyday life. The convenience of camera phones is very useful for these type of situations for their portability and fast usage. Furthermore, the cataloging functionalities of the “Photo Wallet” application are of very good use when people need to build their events albums.

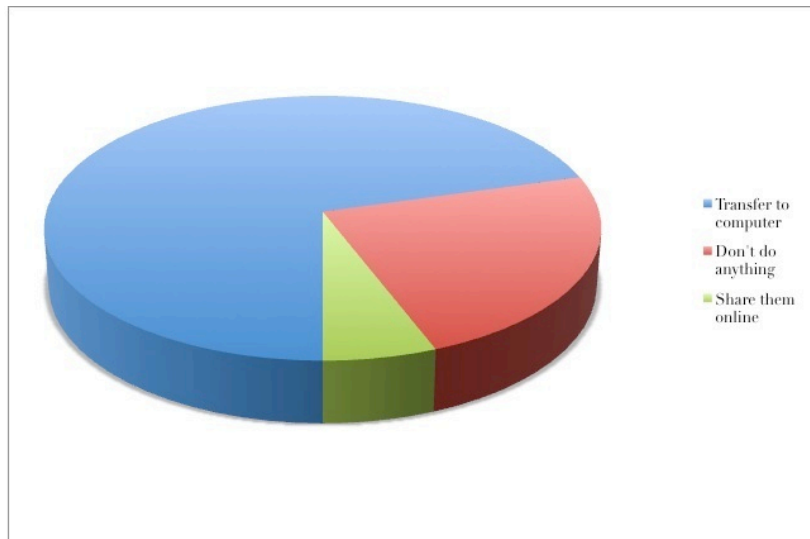


**Figure 4.4 Occasions people take photographs the most**

Figure 4.5 displays what people do with the photographs taken with their cell phone or mobile devices after they have been taken. 60% of the people download their photographs to the computer. The scope of this study does not contemplate what they do with those photographs after they are downloaded, is just to have a clear picture of the actual use they give to their photographs. Only 10% of the sample uploads their mobile device photos to the Internet, presumably to social networking sites like Facebook or

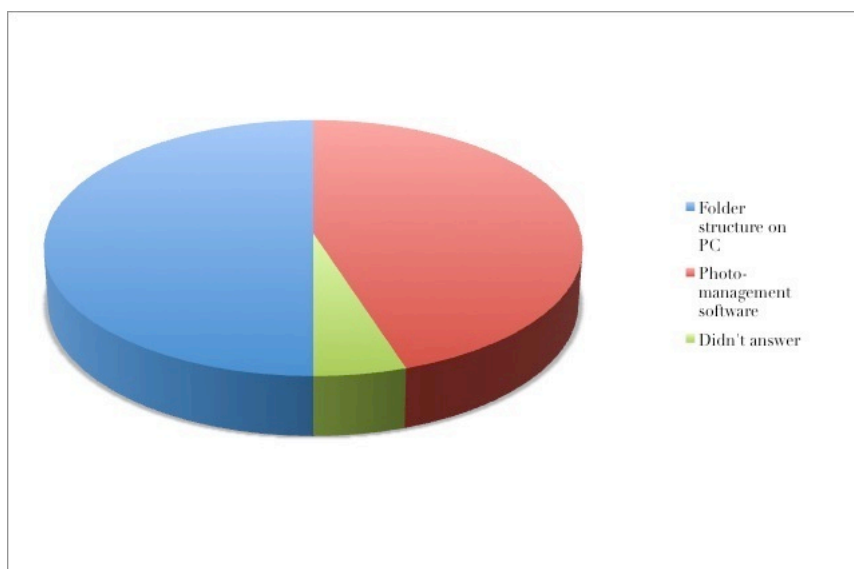


Flickr. 30% of the people don't do anything to the photos, they keep them in their mobile device without giving any further use to them. The latter, sheds some light on what the "Photo Wallet" application might do for this kind of users, it might give them a tool to build albums with those photographs that stay on the device and it might allow them to engage in other activities to enjoy the photographs they have taken after the event took place.



**Figure 4.5 Uses of the photos after being taken**

Figure 4.6 shows how people manage their digital photographs. 45% of the participants currently use photo management software to assist them in their organizational tasks, 50% don't use any photo management software and rely solely on a folder/file structure in their PC to organize their photographs. This also provides some leads on the familiarity the user has with organizational structures in the computer.



**Figure 4.6 Digital photography management**

Another lead provided by this study was that 75% of the participants categorize images into groups of events, and 25% of them don't do any of this, presumably, they use some other kind of organizational structure that doesn't rely on groups of events but on dates.

After performing the small market analysis, a few **conclusions** were drawn that helped shape the experience of the "Photo Wallet" application:

- There's a **high level of familiarity with digital photography** and a broad use of camera based cell phones.
- People use **organizational structures** to catalog their photographs around events. This could be translated easily in the design of the "Photo Wallet" application into the albums metaphor.
- There's a **low level of familiarity with photo management software and applications for smart phones and mobile devices**, leading to assume that some of the metaphors implemented in the design of the application would have to rely on the metaphors already established on the desktop to organize photographs.
- The "Photo Wallet" application might become an **alternative or a substitution of the print-out photograph**, since several people of the sample reported an interest in printing the photographs taken with their devices.
- People use their camera very often, mostly on special occasions. This experience will be greatly enhanced with the convenience of the *always at hand* camera.

## 4.2 Using photo collections on mobile phones

In the camera phone context, people have been presented with a range of new options for performing several photographic activities, like screen-based sharing of images. Most of the times this is preferable than printing photographs because it takes into consideration the issues of costs and convenience. A consequence of this fact entails that photography becomes an activity about consumption, and the navigation of entire media collections representing life histories.

Immediate review after capture and the almost instantaneous sharing of images are the most important advantages of digital photography over analogue photography. But a reason why prints are still in use has to do with the inaccessibility and vulnerability of digital photos across several storage devices. This could represent a problem in the long term as the devices that support our digital life now may become obsolete over time.

Furthermore, another reason for the persistence of prints involves the way in which they can be shared during social exchanges and provide triggers for conversations. This is why users are still not ready to give up on the beauty and simplicity of physical and tangible prints.

The industry continues to present casual forms of image capture, but what usually happens is that manufacturers overlook the important fact that people don't know what to do with all these photographs once they have captured them. Even when a complete set of

photographs is shared in a conversation, what usually happens is that storytelling arises from a single photograph rather than developing over a narrative or sequence of images. So the use of photographs starts to turn into a series of reductions of the entire collection, down to individual images that represent a story worth telling. This analysis leads to the assumption that users don't want more images but fewer images with more significance and personal value [40].

This simplicity approach finds a place in interfaces for small screen devices, such as camera phones. Digital images are easy to share with others in this medium, and with current advancements in device technology, the application can support the activity of browsing and selecting photos as a rich and personal process that evokes emotions and ideas. Under this light the key challenge is to design an application that can enrich the experience and that makes the organizing of digital images a rewarding task by using two key properties in the process:

1. The tangible character of printed photographs: this could be interpreted as a hands-on experience. And the gesture-based interaction is an intuitive value that enhances the experience.
2. A personal touch and story: allow the users to choose how to organize and order their photos adding their own personal touch and purpose to each album.

### **4.3 Reviewing the recommendations**

Based on the research developed in the state of the art review, and supported by the small market research conducted, we are able to base the guidelines of the interface upon several assumptions. It's important to take into considering that the market research was based on a small sample of population, which is not significant, this was only a preliminary study that was performed to offer some support to the state of the art review and to indicate further developments:

1. Photographs are used for a variety of activities; the most important one is the support of memories, narratives and identity.
2. With current digital photography products in the market, it is easier now more than ever to capture a high volume of images.
3. The ubiquitous camera of mobile devices is starting to replace portable cameras as their main capture device for their convenience and their increasing higher image quality.
4. It is safe to assume that a consequence of the snapshot camera replacement is the use of camera phones for important events such as birthdays, weddings, etc.

It is important to note that browsing photographs on small screen devices poses several challenges, and when designing for mobile devices the main consideration to have is what functionality is absolutely essential to have and what is dispensable [41]. Based on these challenges, the design of the "Photo Wallet" interface will be based on the following recommendations [42]:

1. Events: locating events is absolutely the most important photo searching task. When designing photo-searching interfaces the main goal should be to provide fast access to events. This is better accomplished by using event folder names. If an event is remembered accurately, the interface should be able to provide keyboard and character searches.
2. Single photographs: it is important to provide support to pick out target photographs once the event folder has been found.
3. Properties: among the properties the interface should provide are the support of the entire process of selecting, reviewing, filtering and grouping of photographs. There should also be provided support for navigating between these groups and the original events folder to allow the user to review the current group and go back to an appropriate event folder. For each selected photograph the user should be able to go back to the original event to get some context.
4. Pre-organized photo collection structures: users also utilize property folders where they use arbitrary photo groupings, working directories, groups for export.
5. Temporal photo organization: if temporal organization is to be supported, events and photographs have to be placed in the order they were created and captured, with the correct date and time.
6. Thumbnail sizes and quality: photographs should be able to be compared to one another at any zoom level. This represents a challenge since the screen on these devices is small compared to the screen of a desktop computer where the thumbnail arrangement is easier to visualize by the human eye. However, by the time this project is being developed, screen size and resolution is improving by new market offerings, such as Apple's iPad and several other tablet devices by other competitors.
7. The geo-location capabilities of mobile devices should become an integral part of the application's functionality.

The main challenge faced when designing photo searching interfaces on mobile devices is how to make use of the ability of the human eye to process images quickly. This means, how to design interfaces that allow the user to skim over dozens photographs, discard some, and recognize the ones selected. For this purpose, the interface should ensure that the image is presented to the user at an optimal level of visibility and to provide the controls to adjust those values.

#### **4.4 Metaphors exploration**

This section offers an exploration of the metaphors or concepts implemented in the design of the "Photo Wallet" based on the basic premise of the application: "a tool for mobile devices to help create personal stories around collections of photos", considering the application as a ludic tool and taking into account the limitations of screen size.

There are two key issues to address in this model:

- Is it possible to translate the analogue and, by extension, the physical values associated with a photo collection to the mobile device?

- What activities during the process can contribute to the ludic factor?

The interface will be implemented transferring the desktop experience of dealing with photo libraries and adapt it to mobile devices by taking into account its limitations of screen size.

Each metaphor represents a key aspect in the process of browsing and categorizing photographs on a mobile device. The approach used refers to photo collections managed through digital technologies developed for the desktop [43], and we attempt to adapt them to the mobile space. Each aspect will pose several design implications and we will use them to establish the requirements for the concept to develop in the interface to address these issues:

1. How do people start organizing?
2. What kind of experience is aimed at during the organization process?
3. Which methods do people use on small screen devices?
4. What strategic aspects are important?
5. What kind of results do people aim at?

#### **4.4.1 Metaphor 1 – How do people start organizing?**

A problem people face when organizing their photos into albums involves the problem of disrupting the original chronological organization the user has in the main library of the device [43]. Usually the users don't want to alter this order, so it is important to take into account the consideration of copying the photos from the original library and paste them into the application's storage, or to provide a link between them that reflects the image to be inside the application. In this way, the original configuration will remain unaltered while the user is focused on building the albums and organize the photos around a theme of choice.

#### **4.4.2 Metaphor 2 – What kind of experience is aimed at during the organization process?**

The process of reviewing a photo collection is a valuable and enjoyable experience that evokes memories and feelings. A design challenge of reviewing a digital collection is to translate the same sense of enjoyment of manipulating the photographs and seeing the collection as a whole that evokes the desired thoughts. This experience is only attainable when the user is able to interact directly with their images rather than trying to figure out which buttons to push at the right time.

Current mobile devices are very capable to support this activity since many of the market solutions offer multi-touch screens; this technology allows the physical manipulation of the images with the added value of having the artifact in the palm of the hand. This characteristic of ease of use and portability is one of the most important added values of the modern mobile devices, and an aspect that should prescribe the design of the interaction with the application. Touch screen technologies are a solution that allows the user to quickly select photos to associate to memories and to explore them by increasing their size with finger gestures.

The previous aspects should provide the following design guidelines:

- The browsing, selection and image manipulation should be done with finger gestures to leverage the use of the touch screen of the device.
- The interface should only have the control buttons to add the necessary functionality to create and add properties to each image collection.

#### **4.4.3 Metaphor 3 – Which methods do people use on small screen devices?**

Users tend to organize their media files according to real life event's occurrence time. User needs studies have shown that people want to save their life's memories around three basic types of memories: happy moments, life history and details to facilitate errands [44].

Mobile technologies are mostly suited for capturing media. But with the access to novel technologies, the mobile space has become a versatile platform not only made to capture the media, but also to manage and to share the data almost instantaneously using only one device. Furthermore, the access to the data on the device, and the capacity to collect internal and context data around the capture, can improve the management of all the information stored on the device's memory [45].

In the desktop, the methods used by the average user consist mainly on the use of folders to categorize the photographs around events. In mobile devices, by leveraging the capabilities described previously, users can add levels of categorization and implement not only the event data, but also the places the events took place and date of the events in a more flexible way.

The design should be implemented following these guidelines:

- The user should be able to add relevant categories taking advantage of the geo-tagging and date capabilities added to the metadata of the files.
- The user should be able to add their own categories around events and memories.
- The system should provide the ability to annotate their albums with comments to make more robust the memory process.

#### **4.4.4 Metaphor 4 – Which strategic aspects are important?**

Usually applications limit the users in using their own personal styles. A consequence of this is that the ludic component of the activity is left out and some times is not even considered. So in order to support a ludic and enjoyable experience, the application should offer smart solutions to let the users find their own way during the process and to add their own aesthetics to the collections.

To expand on this idea, the system should be able to offer some suggestions or advice in a clever way to allow the user to have a more rich experience in using photographs. It should also be able to provide a way to relate images between different collections [33], and to take advantage of the characteristics previously mentioned by

relating images using the time and date information, GPS information and other related pertinent data.

#### **4.4.5 Metaphor 5 – What kind of results do people aim at?**

The desktop solutions should be able to be translated seamlessly to the mobile device application. The desktop applications allow users to pick favorites from their collections, add tags and annotate the images. After the organization process, the most popular tools like Google's Picasa, Apple's Aperture<sup>15</sup>, Adobe Photoshop Lightroom<sup>16</sup> allow to share the collections via e-mail, upload to the web, burn CDs or make slideshows, thus making the experience more enjoyable by presenting the option to showcase the collections and not leave them stagnant on the digital library with no one to share with.

As a dedicated image organizing mobile application, focused solely on presenting stories, the aspect of sharing is very important to implement in the design of the interface as an option that is easy to have access to once the collection is complete, and to present the user with the choice to share the photos co-presently with another person -like physical printed photos, directly from the device, or to share them online.

This interface aims to provide a playful way of creating triggers for stories, and must work as a tool to help the user create a personal story from a collection of images. It is inspired by the concept of Homo Ludens [37], and by other approaches of ludic technologies [38] where storytelling is taken as a ludic, engaging and exploratory activity [39]. In that sense, the purpose of this project is to design an interface for mobile devices with photographic capabilities that's easy and fun to use, that supports the activities of browsing the photo library -that is, the photos taken with the device itself, and that is able to categorize those images into simple groups of photos to provide a trigger to storytelling around those photographs, corresponding to the metaphor of a photo wallet.

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<sup>15</sup> <http://www.apple.com/aperture/>

<sup>16</sup> <http://www.adobe.com/products/photoshoplightroom/>

## Chapter 5

### Interface Design

This chapter presents the concepts behind the “Photo Wallet” application, the interaction model, and the interface architecture developed based on the basic behaviors prescribed by the iOS Human Interface Guidelines [46] to establish how the user will manipulate the interface and execute the actions required to browse, select and manage photo collections.

#### 5.1 The “Photo Wallet” conceptual model

The conceptual model is based on the metaphor of a photo wallet, where people store their photos of family and important events to share with friends in casual conversations. These images are print-out photographs people store in sleeves of their wallets. This same metaphor of physical images and the analog character photography used to have, will be implemented later on in other stages of the interaction, where images of rolls of films will be shown to illustrate other photos stored in the device’s memory.

#### 5.2 System requirements

Before explaining the design of the application’s interface, it is important to choose a specific mobile device and configuration to build the interface around since it’s very important to follow certain design guidelines prescribed by the manufacturer of the device. For this project it was chosen Apple’s iPhone, this decision is a consequence of the phone’s increasing popularity, its large user base, and all the information there is available to develop applications for the iOS<sup>17</sup> operating system.

This device selection does not exclude other platforms as available options for the application to run. At this time, many other platforms offer the same multi touch and gesture functionality as iOS devices, so it is important to note that the “Photo Wallet”

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<sup>17</sup> <http://www.apple.com/iphone/ios4/>



application is not exclusive to iOS devices and is extensible to other touch based operating systems, as well as other mobile and tablet devices.

Since one of the main ideas behind this project is to build an interface that provides an enjoyable process of selecting and building stories around photographs, the touch screen of the iPhone and iPod Touch will provide a hands-on experience and a feel of physical manipulation of the photographs, thus bridging the gap between the screen and the user, and maybe increasing the sense of handling printed papers.

Apple Inc. published their iOS Human Interface Design Guidelines [46] which developers and interface designers should follow when building applications for Apple's mobile platform. These guidelines are taken into account in the design of the interface for usability and aesthetic purposes, and to guide some of the user behavior e.g. finger gestures.

Some important advantages these new touch screen devices offer is their large screen size, this is optimal for viewing images at full screen resolution and, since the device doesn't have a keyboard, the manufacturers came up with the technology necessary to handle the functionalities of the device like interacting with realistic onscreen objects and, in many cases, operating them as if they were real-world objects. Figure 5.1 shows some of the most popular multi-touch devices:



**Figure 5.1 Apple's iPhone, iPad and Android device**

At the moment of the development of this project, the current version of the iPhone is V. 4, and the iOS version is 4.3. The following is an overview of the specifications of the current device:

1. DISPLAY AND STORAGE
  - Display Size: 3.5-inch (diagonal) widescreen
  - Display Resolution: 960 by 640 pixels (326 ppi)
  - Capacity: 16 or 32 GB
  - Input Method: Multi-Touch
2. SOFTWARE
  - Original OS: iOS 4.0 (8A293)

To be able to emulate an actual photo wallet, this kind of mobile devices offer an easy way to leverage this metaphor, because their size is similar to printed photographs and allows not only for easy portability, but also for easy manipulation when showing to

another person. Furthermore, the screen size also enables several people to view photographs at a good size and definition to share with others easily in conversations or a social exchange.

### 5.3 Multi touch gestures

Reviewing the basic multi touch interaction developed to control the functionalities of the application, these are going the basic gestures the user will be able to perform to manipulate the interface:

- Tapping iPod playback controls
- Dragging, pinching, or swiping objects
- Sliding On/Off switches
- Flicking through pages of photos
- Spinning picker wheels to make choices

Figure 5.2 shows a graphic representation of how the gestures are performed:

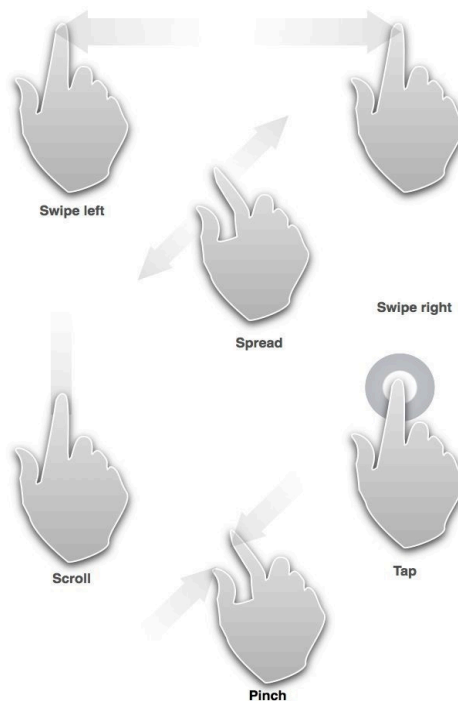


Figure 5.2 iOS gestures

### 5.4 Interaction design

Based on the state of the art review, creating photo collections is about retrieving memories of events and putting them together to build stories around them on top of an organizational structure determined by the user. The design of the interface will be approached from this point of view and two basic functionalities to address the storytelling process that will be implemented:

1. The creation of albums or photo collections based on the stories the user wants to build (authored stories) choosing each photograph from the photo library stored in the device's memory - linear storytelling.
2. The connections between individual photographs based on related characteristics of the metadata recorded in each photo: geo-tagging, date and time of capture, and face detection technology implemented on the people photographed. This feature introduces a non-linear storytelling approach since each image will offer different paths to take in each story, adding even more reminiscing moments to each storytelling session.

Both modalities explore two facets of storytelling. Linear storytelling, in the sense of presenting the content in the order is meant to be seen every time it is experienced. The non-linear storytelling element is implemented when the system creates associations of photographs based on the metadata of the capture, thus making the final delivery of the stories variable each time the user chooses to view different associations between photographs when jumping-off points are taken [47].

#### 5.4.1 Album mode: creating and managing albums

In *Album mode*, the user will be able to build albums or photo collections, based on personal stories. This process aims to provide the user with the experience of thinking and reflecting about the past events captured in the photographs, thus becoming a retrospective process [48].

It is important to understand how the storytelling process works to be able to associate it with how the user will interact with the application. The storytelling process can be presented in three parts as seen in Figure 5.3 [49]:

- Story creation: done by the author
- Storytelling: in this case, it will be done by the author at the moment of sharing the collections with the support of the “Photo Wallet” application
- Story receiving: done by the recipient of the story

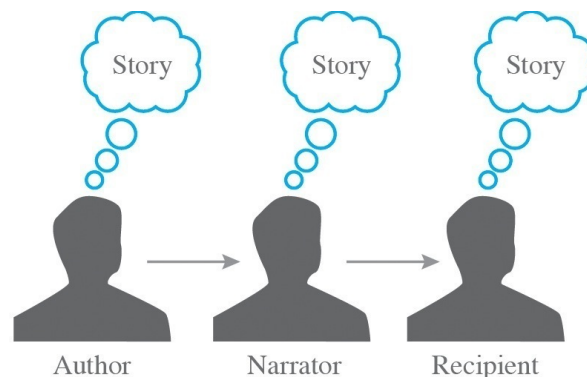


Figure 5.3 Storytelling process

The process of creating narratives around photographs is considered to be of a social nature, i.e. social photo storytelling, thus the creation of albums structures the sharing of personal and interpersonal experiences [50]. Users typically enjoy the creative

process involved in photo story creation and they rely heavily on emotional and contextual information in order to select images.

### How are albums created?

The opening screen of the application (Figure 5.4) displays the latest albums created. This design decision has to do with the assumption that the user would want to review and share the most recent albums created, because the access to memories from recent events is easier than to memories from older events. At this screen, the user will be presented with two options: searching for a specific album already created narrowing down the search by categories, or to create a new album.

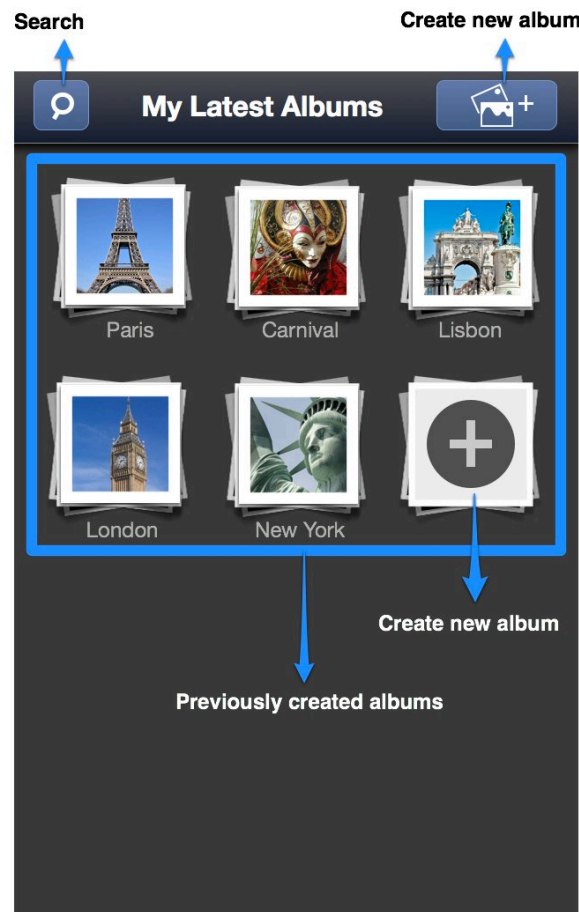


Figure 5.4 Application's home screen

In order to create collections the user will be able to choose the images he wants by reviewing the photographs stored in the photo library of the device. The creation process, shown in Figure 5.5, will be divided into these steps:

1. **Selecting a category the photo collection will be based on.** This basic categorization will invite the user to catalog their stories around three basic categories: events, places and groups of people. This has to do with the basic principle explained in previous chapters, where the user prefers to build their collections around events to associate with memories and stories. Additionally, the user will be presented with a fourth option, where she will be able to input a new basic category.

2. **Adding the basic information of the album.** In this step the user will add the name of the photo collection being created, a basic description of the story being told by the photographs, and an option to enable the display of location data.
3. **Selecting the photos.** Here the user will select the photos stored in the photo library of the device he wants to include in the collection using the tapping gesture. The order of the photos displayed is based on the time and date metadata, and the same order will be established on the collection.
4. **Reviewing album.** Once the album is created, the user will be able to view each photo of the album at full screen size using the flicking through pages of photos gesture. The options control of each photo will be displayed by tapping the screen so it is possible to access the image information, adding new images to the album, viewing the album in grid mode, that is displaying each image side by side, and accessing the “Connections” feature of the application, where all the photographs that share similar information with a single photograph will be displayed.

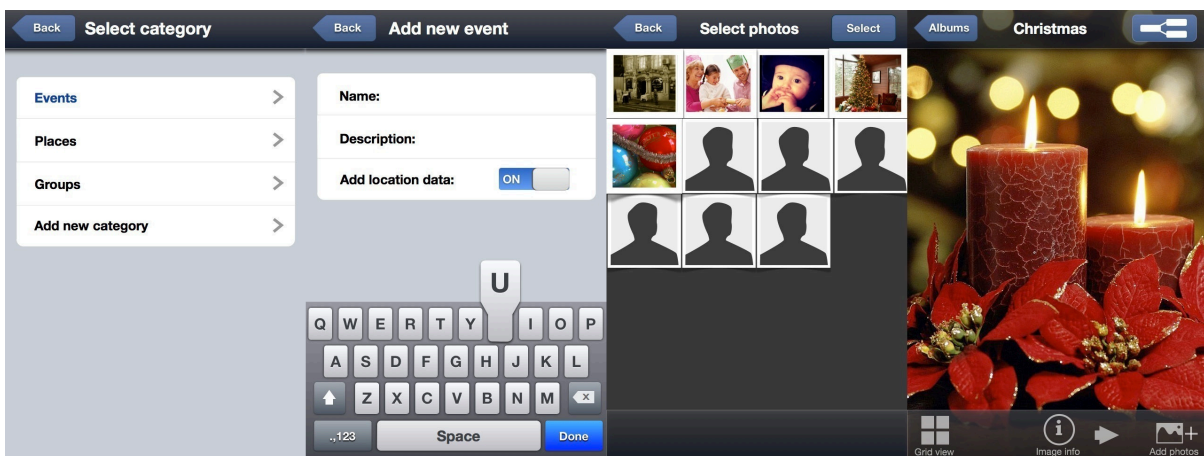


Figure 5.5 Album creation process

### 5.4.2 Free-story mode

The free-story mode performs the most novel feature of the “Photo Wallet” application. Here a non-linear storytelling process is implemented and the ludic feature is explored allowing the user to achieve different story outcomes every time he decides to view different connections between photographs.

In order to explain how the concept of “Free-story mode” works, and to understand how the associations between photographs are done, a scenario where a user uses the application to create an album will illustrate how the process of connecting photographs from different sets will develop a non-linear storytelling format.

*It's January, and Jennie is reviewing her photographs taken with her mobile device to create an album about her Christmas holidays. She wants to include photographs since the beginning of her holiday until New Year's celebration. Coincidentally, her birthday is on December*

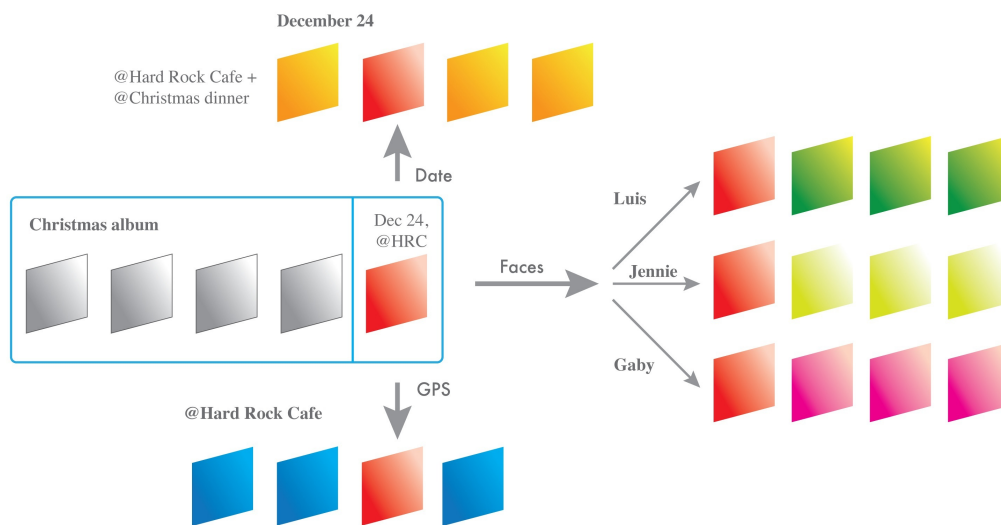
24, so her husband Luis decided to invite her and their daughter Gaby to her favorite restaurant, the local “Hard Rock Cafe” for a nice birthday lunch before Christmas Eve. Later that day, her family celebrated Christmas dinner and opened presents around the Christmas tree.

Jennie picked all the single photographs she needed to build her album and remembered all the events from Christmas 2011: rides with the family, Christmas decorations, games with the kids, her birthday, Christmas dinner, opening presents, new year’s celebration. When showing the album she created on her mobile phone to friends from work, a single photograph from her birthday encourages a conversation about how her husband took her to “Hard Rock Cafe” for lunch and she ordered her favorite plate, her friend asks her if she has more photos from her visit to the restaurant.

To show the photographs that are related to that single photograph of her birthday, Jennie has to click the connections button to have access to the different options to view related photographs that share the same metadata. When a photograph is taken, the mobile device is able to record three types of information about the file:

1. Time/date of the capture.
2. Geo-location information, accessed by the location data provided by the network carrier, or by using the GPS positioning from the own device.
3. Face recognition of the people in the photograph, this capability is feasible to implement since many applications such as Facebook, Apple’s iPhoto, Apple’s Aperture and Google’s Picasa already support this feature.

Figure 5.6 shows a graphical representation of how photographs are related to one another by accessing the metadata information. The graphical representation of the connections forms a graph similar to a mind map, where siblings and child associations are created for each photograph chosen by the user:



**Figure 5.6 Free-story mode diagram**

If Jennie wants to have access to photos taken on December 24, she could choose to see all photos taken on that same day by choosing the **Date** option, this will include the photos taken at the “Hard Rock Cafe” lunch and the photos taken at Christmas dinner.

Additionally, she will be able to choose only the photos taken at her birthday lunch by choosing to view similar photos taken by viewing similar **Location** data, this will display photographs taken only at that place. The third way of choosing photographs is by using the **People** feature, in this specific photograph, the system will show similar photos of the three people present at the birthday lunch, generating even more similar photos of the members of the family. Figure 5.7 shows how to access the related photographs:



**Figure 5.7 How to access the connections**

The following screen (Figure 5.8) displays a sub-menu with three different buttons the user can tap to access photographs depending on the criteria she is interested in at the moment:

1. **Geo-location button:** by clicking this button Jennie will be able to view all the photos taken specifically at the Hard Rock Cafe.
2. **Date Button:** this button will show all the photographs taken at December 24.
3. **People button:** when tapping on this button the application populates the new roll of film with photographs with the same people that appear at the birthday lunch image. This will bring a different array of photographs of the family at different times and places.

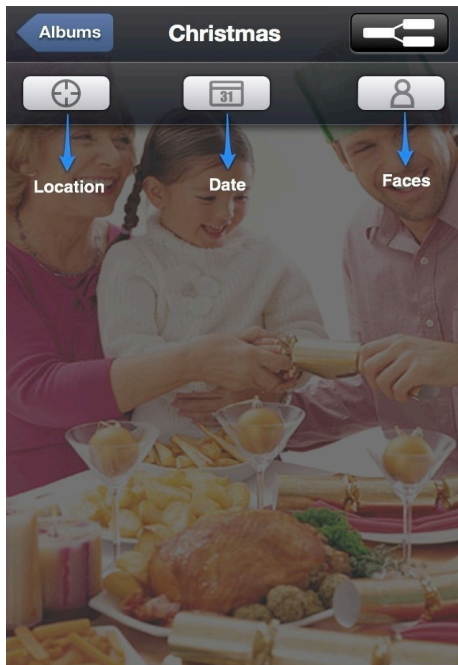


Figure 5.8 Free-story mode screen

To present the images from different associated categories, the metaphor of “rolls of film” is implemented to provide some consistency with the metaphor of analog photography and paper photographs in a wallet. The interface will display each roll of film one on top of the other every time the user taps one of the desired criteria. To view an entire roll of film the swipe gesture will navigate the roll from left to right and in the opposite direction. If the user wants to view a single image from a roll at full screen size by tapping the square icon the image will expand and will fill the entire screen. This will become a recursive process of the user selecting individual images and having access to different memories every time new associations are built from each photograph depending on the criteria the user wants to use to narrow down the selection of similar photographs. Figure 5.9 shows how the “rolls of film” populate the screen:

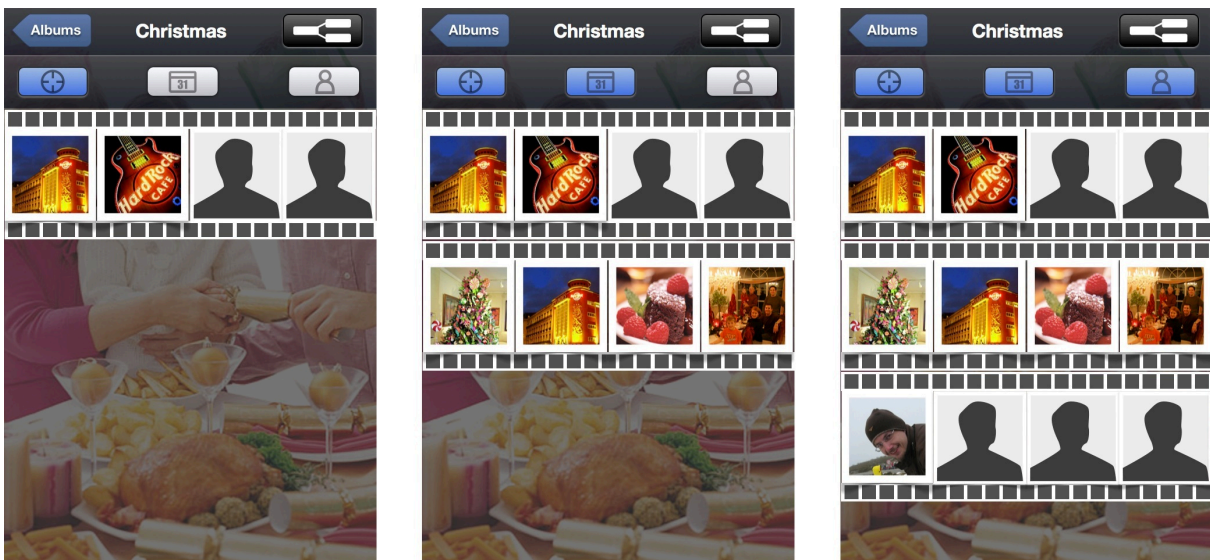


Figure 5.9 Categories “rolls of film”



## 5.5 Interactive prototype

The prototype of the user interface described was implemented using several commercial softwares. To design the interface elements it was used Adobe Illustrator CS5<sup>18</sup>, a vector graphics application that allows creating complicated shapes in vector form. To create the layouts and build the different stages of the interaction it was used the presentation software Apple's Keynote '09<sup>19</sup>, this software allows to create presentations using vector graphics and images, it also enables the creation of hyperlinks of different interface elements and buttons making possible to build the interactivity of the mock-up without having to program any functionality supported by the application.

By using Keynote, the testing of the user interaction on the computer screen is easier to do and the testing on the device itself is also easy to manage by exporting an interactive PDF and transferring it to the device. These technologies offer great benefits in the commercial world when having to fast prototype and user test an application at a high fidelity before committing to the programming of the final product.

The building process of the interface prototype consisted in these stages:

1. Designing the interface elements in Adobe Illustrator CS5 emulating some of the already established interface elements for the iPhone device;
2. Designing the layout of each screen using Apple's Keynote '09;
3. Creating different slides for each screen and enabling hyperlinks to each button that provides functionality;
4. Testing the user interaction by using the presentation mode in Keynote;
5. Exporting an interactive PDF to the iPhone to test at the actual screen size of the device to make sure the interface elements are at the correct resolution, readability and color.

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<sup>18</sup> <http://www.adobe.com/products/illustrator.html>

<sup>19</sup> <http://www.apple.com/iwork/keynote/>

## Chapter 6

### Usability Study

In order to determine the success of an interface, it's necessary to make it useful to a wide array of users. It is essential that an interface for small screen devices presents the information in an easy way, enabling the user to comprehend in a short period of time what are the functionalities the application offers, how to access them, and how to navigate around the different screens. For these reasons, it is important that the design of the interface is pleasing to look at, and also intuitive, maximizing usability.

The International Standards Organization (ISO 9241-11) identifies three aspects of usability, defining it as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use.”

There are some distinctions between the terms usability and user experience. Usability is the ability the user has to carry out a specific task with a product. User experience employs a broader analysis when it takes into consideration the entire interaction the user has with the product, including thoughts, and perception that result from the interaction [51]. For this project, the focus will be to draw conclusions on the entire user experience to be able to identify if the primary objectives of the design were met.

In this sense, it is important to understand that the usability-testing phase is an indispensable phase in the development of any product, application or system. This study should be aimed at identifying possible problems that can compromise the interaction of the user with the interface, problems which can draw the application unusable and unsuccessful.

## 6.1 User group

To be able to assess the usability and, consequently, the success of the interface design, it was chosen a group of 6 users to test the interface. Before the test started, a pre-test questionnaire (see Appendix B) was required to be filled out to determine the users previous experience with digital photography, mobile devices, and the combination of the two. The characteristics of the group were:

- All participants were between the ages of 26 and 35 years old.
- 66.6% were male, and 33.4% females
- 83.34% were Masters degree students, 16.66% working professional
- 100% know how to use a digital camera
- 100% have been using digital cameras for more than 2 years
- 100% have used a cell phone or other kind of mobile devices to take photographs
- 66.6% always transfer the photographs taken with their mobile device to the computer, and 33.4% keep the photographs on the cell phone.

## 6.2 Evaluating Navigation and Information Architecture

Websites, software programs, or consumer electronics require usability studies to determine if the navigation and/or information architecture allows the users to quickly and easily find the information they need, to navigate easily around the product, to know where they are within the overall structure, and to know what options are available to them. Typically, these studies are performed with the use of wire-frames or partially functional prototypes because the navigation and information mechanisms and information architecture are so essential to the design that they have to be figured out before the application is even programmed [51].

In order to evaluate navigation, the best metric to use is task success and performance time. By giving participants of the usability test group tasks to find key pieces of the information (a “scavenger hunt”), it is possible to tell if the navigation and information architecture works for them. The tasks to perform should include all the different areas of the product.

Participants were asked to perform several tasks on the “Photo Wallet” interface prototype listed in the task description sheets (see Appendix C) on the Appendices section. Tasks were written in scripts to make sure all the participants received the same information before performing any task. Tasks were used on the usability test only focused on finding usability problems and not time on task. Also, it was instructed to users that they were not going to be selecting actual photos stored on the device’s memory since they were only interacting with a PDF and not with a running application.

The test was performed using an interactive PDF on an iPhone loaded with a PDF reader application that allows to “push” the buttons of the PDF, and navigating between the different screens of the application. This technique shows the users how the different

functionalities of the application are accessed and emulates very efficiently the actual experience of the application.

### **6.3 Data analysis**

To evaluate the experience with the interface it was used a Likert scale to capture the intensity of the user's experience interacting with the interface. Several statements about the design and interaction were presented and the respondent is asked to offer their level of agreement or disagreement with each statement. The usability assessment (see Appendix D) was designed to test 3 different categories of the interface:

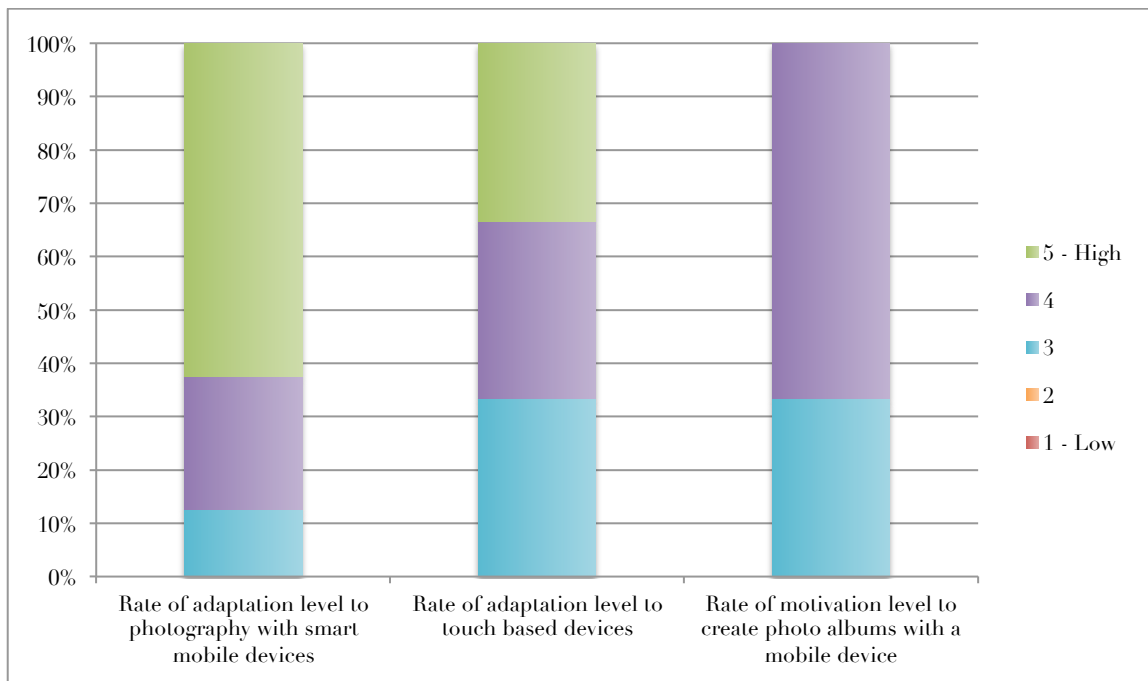
1. The level of adaptation of the users to smart phones/mobile devices
2. What they thought about the design of the interface and the interaction with it
3. How they felt about the experience of sharing photographs with the application, keeping the photos always at hand, and sharing stories with the help of the "Photo Wallet"

At the end of the responses, the users were asked to provide some feedback on the overall experience and to comment on some aspects they would like to see improved in the application.

#### **6.3.1 Level of adaptation to smart phones/mobiles devices analysis**

Figure 6.1 shows that over 60% of the user group has the highest level of adaptation to photography with mobile devices, over 20% graded their level of adaptation at level 4, and 12% rated their adaptation in a middle ground. The adaptation level to touch based devices shows more difficulty for the participants, since several of them claimed to not have enough experience with these kind of technologies. At the same time, over 65% of the participants graded their level of motivation to create photo albums at level 4, and over 30% showed some indifference to this task.

These results lead to the assumption that maybe the group doesn't feel too inclined to create photo albums with mobile devices because of two probable reasons: a) They don't have enough exposure to mobile device technology, b) they might not consider photography among their interests, or c) they don't consider a mobile device as a "work" device but rather a "casual" device.



**Figure 6.1 Level of adaptation to smart phones/mobile devices chart**

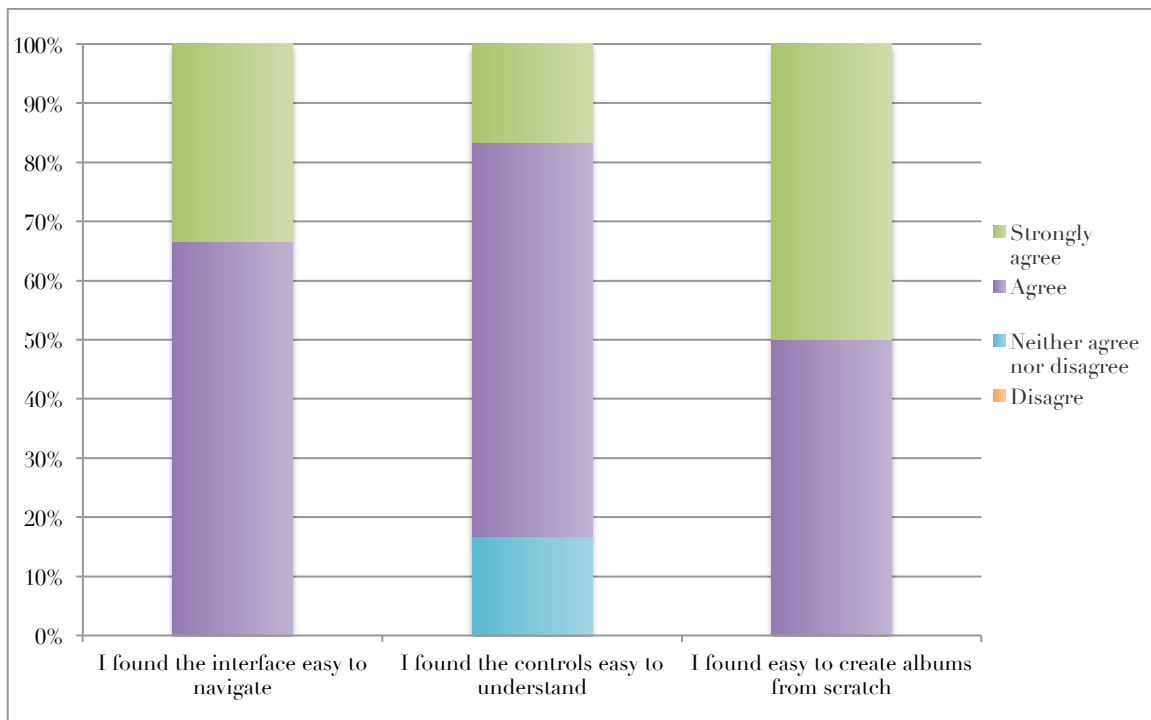
### 6.3.2 Interface design and interaction analysis

Figure 6.2 shows that all the participants found the interface easy to navigate. Almost 35% of the users strongly agree that the navigation was optimal, and the remaining 65% felt good about it. Overall, the interface navigation tested very good, which means the screens are presented in a coherent order and the actions to perform make sense to users.

The controls scored a little lower in the test. Only 15% of the users found extremely easy to understand the controls, over 70% agreed, and the remaining 15% neither agree nor disagree. These results show that even though no one gave the controls a bad rating, the design still presents certain difficulty to users, maybe this is due to the level of experience some of the users have with touch based devices as it is shown in the previous figure.

The album creation process received very good ratings with the users. The processes scored evenly 50%, between ratings of strongly agree and *agree*.

From this analysis is easy to determine that the design component that needs improvement is the controls. Observations made during the user testing process also point in this direction, because several users expressed confusion on the design of a few icons and the messages contained in several buttons. During the free-story mode task, most users found it difficult to access this mode since it wasn't evident where in the interface this feature was accessed.



**Figure 6.2 Interface design and interaction results chart**

### 6.3.3 Experience with the application analysis

Overall, the users felt motivated to access the photographs contained in the free-story mode. When comparing the experience of using the “Photo Wallet” interface with the current experience the users have when sharing photographs, the results are scattered. Figure 6.3 shows that 15% of the users claim the experience with the “Photo Wallet” is highly similar to the experience they currently have when sharing photographs, which means they enjoy sharing photographs with other people co-presently. 55% show some indifference in this respect, maybe because they don’t have enough interest in sharing photographs, and the remaining 30% don’t think the experience is any similar to the one they currently have, this could mean they share photographs either online or by e-mail, or don’t even share photographs with another person during casual conversations.

50% of the users claimed they would very much enjoy using an application like the “Photo Wallet” to always keep their photos with them, this lead to think they enjoyed the convenience aspect of using a mobile device to share photos in social exchanges and to leverage the storytelling aspect of it. Over 35% of the participants would enjoy using the application, and 15% feel indifferent about sharing photographs with the application.

Almost 70% of the participants strongly agree that the “Photo Wallet” would represent a way to share stories with friends. This means the storytelling functionality of the application was achieved with the design. A smaller amount of users agree that this functionality was met and 15% felt indifferent about this. This matches the results obtained in the previous question, which leads to think everyone will not enjoy the

application at the same level because not everyone has the same amount of interest in photography and the sharing of photographs.

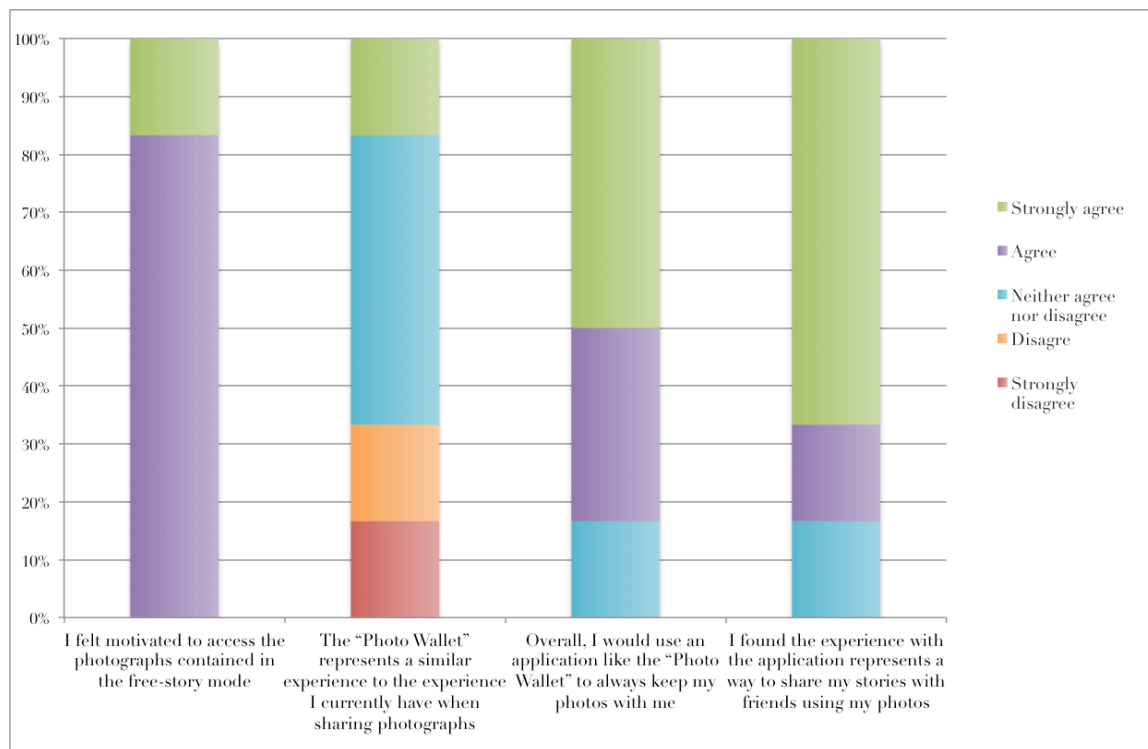


Figure 6.3 Experience results chart

#### 6.4 Other findings and comments

The test group users were given the opportunity to provide some feedback on the overall experience they had with the interface, and to comment on some aspects they would like to see improved.

- User No 1 felt the design of the interface was simple and straightforward to use. Found the concept very interesting and useful. The user offered a suggestion: “the initial screen could have an icon (album icon), with a plus sign on it to lead the user into creating a new one”.
- User No 2 wrote: “Organizing pictures is a difficult work and many times I skip it. “Photo Wallet” is an easy and fun way of seeing pictures that are connected. I liked very much the idea of interconnecting pictures from the location, the date and the people in the pics. What I would like to see improved is a way to see the amount of pictures in each location”.
- User No 3 wrote: “Since I’m inexperienced with smart phones I might have some problems understanding the meaning of the buttons. When doing the task of deleting photos my eyes where stuck in the bottom part of the screen (lower menu), so I didn’t see the Edit button, and when I finally accessed that screen, I didn’t understand what to do. Overall I found the interface to be very clean”.

- User No 4 felt the application would be a useful tool to share photographs. He suggested smart search functionality, where the application is able to access the search history of photos, and when a search is conducted, it displays the most viewed photographs.
- Users No 5 and 6 didn't provide any comments or feedback.



## Chapter 7

### Conclusions

The objective of this Master Thesis was to develop the interactive prototype of an application for mobile devices to support the process of reminiscing and storytelling with photographs. The interface should be able to offer the functionality of creating albums, a task most often associated with the desktop, adapted to the small screen of the mobile device. Additionally, the interface should also be able to aid in the storytelling process during social exchanges by offering the possibility to users to access the photographs that are interrelated with similar metadata. In order to achieve the proposed goals, the following steps were followed:

- An academic study of the photography practice were some of the most well regarded analysts in the anthropology an academic field were researched, to understand the reasons behind everyday photography;
- A review of proposed recommendations and guidelines by Human Computer Interaction researches to posses a firm foundation on what was already being done by specialists in photography software;
- A study of several state of the art softwares designed for photo management, ludic experiences, and mobile devices. In this step several basic functionalities were identified, and different and similar metaphors for handling photographs were recognized;
- After a firm theoretical foundation was achieved, a small market research was conducted to determine several characteristics of the target audience in regards of their computer usage, digital photography experience, mobile device use, and ways of managing photographs,
- Then, a specification of the interface was proposed based on the market research findings and the theoretical foundation established by the review of the most important authors in the field. This specification contains several functionalities to

implement with the application and certain expectations that should be met by the design. Also, it was developed an exploration of the metaphors that should be implemented in the interaction with the device;

- Having the specification of the application's functionality, a prototype of the interface was designed. The prototype is based on the same touch gestures already familiar to many users with mobile device experience. The interactive prototype was designed using a set of commercial graphics software, creating every screen for every time the user executes an action. The buttons of the interface also offer active behavior by programming were every button should lead in the interface. Then, an interactive PDF was exported to upload into a smart phone for usability testing;
- Finally, after the prototype of the interface was completed, a small user test group was gathered to perform usability studies. The test consisted in performing several tasks written in a script that was handed out to them before starting the test. This test was designed to use several functionalities of the interface and to determine the flaws in the design and the difficulties the interaction presents to different users. The conclusions drawn from this study determined that the main objectives of the interface were met, the users felt very compelled by the use of this kind of tool on a mobile device and felt that the storytelling aspect of the photographs was exploited by the design. This study also demonstrated that this application was designed for users with a high level of experience with touch based devices, and that users who are not familiar with touch based technology can have some difficulties in understanding how the application works lowering their motivation to share photographs.

At the end of the project report, the documents used in the usability testing are presented in the Appendix. These documents include:

- Appendix A: market research questionnaire distributed online;
- Appendix B: pre-test questionnaire asked to the participants of the usability study;
- Appendix C: script containing the task list assigned to the participants of the usability study;
- Appendix D: usability assessment sheet given to users to fill out after the tasks were completed to provide feedback on the design and interaction with the interface.

## **7.1 Directions for future development**

The first task for future work on this project would be the implementation and testing of a working prototype of the Photo Wallet application on a smart phone like the iPhone or Android system, because currently these 2 devices are very popular amongst users and offer touch screen functionality, incorporating what was learned from the hi-fidelity usability studies.

Revising the design of the interface would be mandatory when adding a lot of photographs to the system. At this point, the interaction with the application might turn difficult because of the small screen size.

Other methods of search might be implemented by combining logic operations using specifics dates, times, places, people, at the same time, *i.e.* place+date, date+people+people... etc.

A next step in improving the application's interface, is making organizing collections of digital images a more rewarding process, maybe with the introduction of new ways of labeling. Although during the project the decision was made to limit the design space to the interaction part of the organizing solution.

The introduction of new ways of annotating photographs that not rely only on typing text on the screen but using sounds and audio clips from the time the photo was taken. This feature was heavily studied by Frohlich [4] indicating that sound is a major component of accessing memories.

When the albums are created, this photo sets could also be exported into photo sharing sites like Flickr or Facebook, to leverage the sharing aspect of the social network sites.

An even more ambitious task, would be to develop an online photo sharing platform exclusive for the Photo Wallet application, where the collections are exported and the connections between photographs are accessed between multiple devices via cloud services.

Privacy is of concern when it involves photographs of family, so privacy functionality would be of great use in cases when other people are manipulating the mobile device. For this purpose, a smart solution to implement is to use a password to open the application or to password protect each album.

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# Appendix A

## Digital Photography Experience Questionnaire (Market Research)

### General Info

1. Age:

- Less than 18     18~25     26~35     36~45     56~65  
 over 66

2. Gender:

- Male     Female

3. Occupation:

- Undergraduate     Graduate Student     Working professional     Others

4. What kind of computer system are you familiar with the most?

- Microsoft Windows     Apple Macintosh

### Computer experience

5. How long have you been using computers (years)?

- 1-3     4-6     7-9     10+

### Mobile devices experience

6. Do you own any or several of these mobile devices?

- iPod Touch     iPhone     Blackberry     PDA     Android  
 Windows phone     Others    Which one? \_\_\_\_\_

7. How long have you been using a cell phone or any other mobile device (years)?

- 1-3     4-6     7-9     10+

8. How many hours each day do you use a mobile device (hours)?

- 1-3     4-6     7-9     10+

### Digital Photography Experience

9. Do you or any of your family members own or know how to use a digital camera?

- Yes     No

10. How long have you been using digital cameras?

- Less than 6 months     7-12 months     13-18 months  
 19-24 months     More than 25 months (i.e.2 years)

11. How often do you use a digital camera to take photos? (Approximately)
- Everyday       once a week       once a month  
 once every 6 months       only on social events
12. In what kind of occasion do you use digital camera to take photos the most?
- Trip       Party       Special event (e.g. graduation)       Daily life        
Holidays       Others\_\_\_\_\_
13. Have you ever used a cell phone to take photographs? If not, continue with the next section of the questionnaire.
- Yes       No
14. If you have, what do you do with the photographs afterwards?
- Keep them in the cell phone and not transfer them to the computer  
 Transfer them to the computer  
 Share them online by uploading them directly from the cell phone  
 Show them to other people directly from the cell phone screen  
 Don't do anything, just keep them there to browse them when you have time to spare
15. Would you be willing to print any of the photographs taken with your cell phone?
- Yes       No
16. Have you ever used any application for photo management on your mobile device? If so, please name the application.
- Yes       No      Name: \_\_\_\_\_

**Photo Management Experience**

17. How do you manage your digital photos currently?
- Photo management software       Use file-and-folder       Others\_\_\_\_\_
18. Do you create albums (/folders) to categorize photos into groups?
- Yes       No
-



# Appendix B

Participant # \_\_\_\_\_

## Photo Wallet pre-test questionnaire

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### General Info

- Age:

< 18

19 - 25

26 - 35

36 - 45

> 46

- Gender:

Male

Female

- Highest education level:

Undergraduate student

Graduate student

Working professional

Other

### Digital photography experience

- Do you own or know how to use a digital camera?

Yes

No

- How long have you been using digital cameras

< 6 months

7 - 12 months

13 - 18 months

19 - 24 months

> 25 months

- Have you ever used a cell phone or any other mobile device to take photographs

Yes

No

- If you have, what do you do with the photographs afterwards?

Keep them in the cell phone and not transfer them to the computer

Transfer them to the computer

Share them online by uploading them directly from the cell phone

Share them with other people directly from the cell phone screen

Don't do anything, just keep them there when you have time to spare

# Appendix C

## Photo Wallet. Task Description

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- It's January, and you want to create an album with the photos you took with your cell phone about your Christmas holiday, Christmas dinner, your kids, and your birthday. Your birthday was on December 24, the same day you celebrated Christmas dinner with your family. **TASK:** Create an album about you entire Christmas holiday.
- After you create your album, you want to browse through your photos. You saw a photo that caught your attention and you want to see the exact day it was taken. **TASK:** View the Christmas photos contained in your album without the interface controls, and then try to view the metadata information of the photograph.
- After reviewing your album, you realized you missed an important photo about the Christmas dinner with your family. **TASK:** Add the dinner photograph to the Christmas album, and then go back to the beginning of the album so you see your new set of photos.
- After a final review, you realized there are too many photographs in your album and want to delete some of them. **TASK:** Go to the grid mode of your album to access the delete functionality.
- You had second thoughts, and decided to leave the album as it is. **TASK:** Cancel the delete operation and instead check the entire album information.
- Now you thought about the trip you took on Carnivals, and want to see you Carnivals album. **TASK:** Go back to the main menu and conduct a search to see all your albums created under the EVENTS category to look for the Carnivals album.
- You are having a dinner with some of your friends, and one of them asks you about your holidays, so you decided to show her the album you created recently. **TASKS:** Go back to your Christmas album and browse through your photographs and stop at the photo with 3 people sitting at a table celebrating and eating lunch.
- Coincidentally, your birthday is on December 24, so your husband/wife decided to invite you and your daughter Gaby to your favorite restaurant, the local "Hard Rock Cafe", for a nice birthday lunch before Christmas eve. Later that day, you and your family celebrated Christmas dinner and opened presents around the christmas tree. Your friend want's to see more photographs taken at the Hard Rock Cafe on your birthday. **TASK:** At the photo of the family celebrating a birthday, access the function to see the photographs taken at your birthday lunch when you were at the Hard Rock Cafe.
- You saw a photo of the Hard Rock Cafe building that caught your attention. **TASK:** view the photos of the building. To finish the test, go back to see all the albums already created with the application.

# Appendix D

Participant # \_\_\_\_\_

## Photo Wallet Usability Assessment

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1. How would you rate your level of adaptation to photography with mobile devices?

1 - Low	2	3	4	5 - High

2. How would you rate your level of adaptation to touch based devices?

1 - Low	2	3	4	5 - High

3. How would you rate your level of motivation to create photo albums with a mobile device?

1 - Low	2	3	4	5 - High

4. I found the interface easy to navigate

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

5. I found the controls easy to understand

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

6. I found easy to create albums from scratch

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

7. I felt motivated to access the photographs contained in the free-story mode

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

8. The “Photo Wallet” represents a similar experience to the experience I currently have when sharing photographs

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

9. Overall, I would use an application like the “Photo Wallet” to always keep my photos with me

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

10. I found the experience with the application represents a way to share my stories with friends using my photos

Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

11. Briefly, provide feedback on the overall experience of “Photo Wallet” interface and comment on aspects you would like to see improved

# Appendix E

Table E.1 Market research results

Gender	Age (years)	Education level	How long have you been using computers (years)?	Do you own any or several of these mobile devices?	How long have you been using a mobile device (years)?	How many hours each day do you use a mobile device?	Do you own or know how to use a digital camera?	How long have you been using digital cameras (months)?	How often do you use a digital camera to take photos? (Approximately)	In what kind of occasion do you use a digital camera to take photos the most?	Have you ever used a cell phone or other mobile device to take photographs?	If you have, what do you do with the photographs afterwards?	Would you be willing to print any of the photographs taken with your mobile device?	Have you ever used any application for photo management on your mobile device?	How do you currently manage your digital photographs?	Do you create albums (/folders) to categorize photos?
Female	18-25	Graduate student. Masters degree	4-6 years	Android	1-3 years	1-3 hours	Yes	19-24 months	Once a week	Trips, Parties, Holidays	Yes	Transfer them to the computer	No	No	Use files into folders structure on the PC	Yes
Female	26-35	Working professional	10+	iPod Touch, Blackberry	10+	1-3 hours	Yes	> 25 months	Only on social events	Trips, Parties, Especial events, Holidays	Yes		No	No	Photo-management software on the PC	No
Female	26-35	Graduate student. Masters degree	10+	iPod Touch	10+	<1	Yes	> 25 months	Only on social events	Trips, Especial events	Yes	Don't do anything, just keep them there to browse them later	Yes	No	Use files into folders structure on the PC	Yes
Male	>45	Undergraduate	10+	Blackberry, PDA	10+	1-3 hours	Yes	> 25 months	Once a month	Trips, Parties, Especial events, Daily life, Holidays	Yes	Transfer them to the computer	Yes	No	Photo-management software on the PC	Yes
Male	26-35	Working professional	10+	PDA	10+	1-3 hours	Yes	> 25 months	Only on social events	Trips, Especial events, Holidays	Yes	Transfer them to the computer	Yes	Yes	Use files into folders structure on the PC	Yes
Male	26-35	Graduate student. Masters degree	10+	iPhone	10+	<1	Yes	> 25 months	Everyday	Trips, Parties, Especial events, Daily life, Holidays	Yes	Share them online by uploading them directly from the movie device	No	Yes	Photo-management software on the PC	Yes
Female	26-35	Graduate student. Masters degree	10+	iPhone	10+	4-6 hours	Yes	> 25 months	Everyday	Trips, Parties, Especial events, Daily life, Holidays	Yes	Transfer them to the computer	Yes	Yes	Photo-management software on the PC	Yes
Female	26-35	Graduate student. Masters degree	10+	No	10+	1-3 hours	Yes	> 25 months	Once a month	Trips, Especial events, Holidays	Yes	Transfer them to the computer	Yes	No	Use files into folders structure on the PC	Yes

Male	26-35	Graduate student. Masters degree	10+	iPhone	1-3 years	< 1	Yes	> 25 months	Once a month	Trips, Parties, Especial events	Yes	Don't do anything, just keep them there to browse them later	No	No	Use files into folders structure on the PC	Yes
Male	26-35	Working professional	10+	mobile phone	10+	< 1	Yes	> 25 months	Once a month	Trips, Parties, Especial events, Holidays	Yes	Transfer them to the computer	No	Yes	Photo-management software on the PC	Yes
Male	>45	Graduate student. Masters degree	10+	iPod Touch, Blackberry, Android, PDA	10+	1-3 hours	Yes	> 25 months	Once a month	Trips, Daily life, Holidays	Yes	Share them online by uploading them directly from the movie device	Yes	No	Use files into folders structure on the PC	No
Male	26-35	Working professional	10+	Android	10+	1-3 hours	Yes	> 25 months	Once a week	Daily life	No		No	No	Use files into folders structure on the PC	Yes
Female	18-25	Graduate student. Masters degree	10+	none	4-6 years	< 1	Yes	> 25 months	Everyday	Daily life	No					
Female	36-45	Graduate student. Masters degree	10+	Blackberry	10+	4-6 hours	Yes	> 25 months	Once a week	Holidays	Yes	Transfer them to the computer	Yes	No	Photo-management software on the PC	Yes
Male	26-35	Working professional	10+	Blackberry	10+	1-3 hours	Yes	> 25 months	Once a week	Trips, Especial events, Daily life, Holidays,	Yes	Transfer them to the computer	Yes	No	Photo-management software on the PC	Yes
Female	36-45	Graduate student. Masters degree	10+	iPhone	10+	1-3 hours	Yes	> 25 months	Only on social events	Trips, Parties, Holidays	Yes	Don't do anything, just keep them there to browse them later	Yes	No	Photo-management software on the PC	No
Female	26-35	Graduate student. Masters degree	10+	Blackberry	10+	< 1	Yes	> 25 months	Only on social events	Trips, Parties	Yes	Transfer them to the computer	Yes	No	Use files into folders structure on the PC	No
Female	26-35	Working professional	10+	iPod Touch	10+	< 1	Yes	> 25 months	Once a week	Trips, Parties, Holidays	Yes	Transfer them to the computer	Yes	No	Use files into folders structure on the PC	Yes
Male	18-25	Undergraduate	7-9 years	Symbian	10+	1-3 hours	Yes	> 25 months	Only on social events	Trips, Parties, Especial events, Holidays	Yes	Transfer them to the computer	No	No	Use files into folders structure on the PC	Yes
Female	26-35	Graduate student. Masters degree	10+	iPhone	10+	1-3 hours	Yes	>25 months	Everyday	Trips, Parties, Especial events, Holidays	Yes	Transfer them to the computer	Yes	Yes	Photo-management software on the PC	Yes

## Appendix F

Table F.1 Usability test results

	1 - Low	2	3	4	5 - High
Adaptation level to photography with smart mobile devices	0	1	1	2	5
Rate of adaptation level to touch based devices	0	0	2	2	2
Rate of motivation level to create photo albums with a mobile device	0	0	2	4	0

	Strongly disagree	Disagre	Neither agree nor disagree	Agree	Strongly agree
I found the interface easy to navigate	0	0	0	4	2
I found the controls easy to understand	0	0	1	4	1
I found easy to create albums from scratch	0	0	0	3	3

	Strongly disagree	Disagre	Neither agree nor disagree	Agree	Strongly agree
I felt motivated to access the photographs contained in the free-story mode	0	0	0	5	1
The "Photo Wallet" represents a similar experience to the experience I currently have when sharing photographs	1	1	3	0	1
Overall, I would use an application like the "Photo Wallet" to always keep my photos with me	0	0	1	2	3
I found the experience with the application represents a way to share my stories with friends using my photos	0	0	1	1	4