

PhotoDispatch Project

**Documentation of Design Steps from
Application Concept to User Interface**

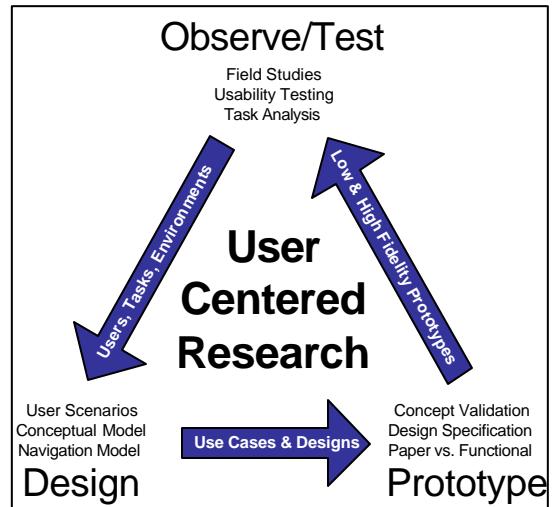
Executive Summary

PhotoDispatch Overview

The *PhotoDispatch* application builds on the voice dispatch, or "Nextel Direct Connect" concept. It is designed to provide functionality that supports *purposeful communication about visual information*:

"I want to show you something RIGHT NOW, wherever I am and wherever you happen to be – it's important, critical or time-sensitive. And it's much better for both of us to be able to see it while we discuss it, than for me to just tell you about it – you'll get a better idea of what's going on here, or what I want to ask you about, or I can answer your question more clearly."

The development of this application idea started in field data collection and progressed through the User Centered Design Cycle – through design and then prototyping, and back to data collection / concept validation.



User Research: Field Data Collection

<http://compass.mot.com/go/98259694>

A user study was conducted to identify communication breakdowns between people who maintain relationships without seeing each other on a daily basis. "Rapid ethnography" research methods were used in the field to gather pertinent information about how family and friends communicate in their natural setting (the home). Six households in the Chicago metro area participated in the month-long study. The data collected described the use of media from greeting cards to instant messaging, and underscored the impact of face-to-face contact on the frequency and intimacy of communication events.

Design: Application Concept

<http://www.waar.labs.mot.com/~vthakkar/projects/tim/>

Several common problems emerged from the analysis of the field data. People separated by distance still have things to do together – not just stuff to talk about together – and today's technologies for long-distance communication do not support purposeful interaction involving the manipulation of artifacts. Activities included wanting to talk about an unfolding situation, with another person that was unable to see what was going on. Or wanting to share information like a recipe or travel plans that could be captured and transmitted much more quickly than having to dictate to the person at the other end of the telephone.

Thus the PhotoDispatch application concept came into being, to create a mediated communication channel capable of assisting users separated by distance in completing a task that requires the use of a shared object, image, or other artifact.

Design: User Interface

<http://compass.mot.com/go/111264623>

Data and findings from unrelated user studies in four domain areas (teenage users, family communication, public safety, and technical support) was reviewed in order to compile a list of essential functional areas the application would support. A "user environment diagram" was then created to make concrete the flow of information and interaction patterns between the functional areas. The purpose of creating a user environment diagram is to separate concerns about the tasks and actions an application should support, from how users will interact with the device (via the user interface) in order to access the functionality that enables them to complete those tasks and actions. Once the user environment diagram was complete, it was clear that the application should support four basic tasks: Acquire, Send, and Label photos, and Memory management. The user interface was designed

according to two basic principles: (1) users should not be forced to remember information across screens, and (2) no more than 2 button presses should be required to access any functionality. A characteristic common across the situations that inspired this application was that sharing of artifacts during a conversation had to happen quickly and easily, or it wouldn't happen at all. (Example: needing to write something down during a phone call – if pencil and paper aren't handy, it won't happen.)

Prototype: iPAQ and Chameleon

<http://compass.mot.com/go/99820816>

Concept Validation: Teenage Users

<http://compass.mot.com/go/111240235>

A concept validation study was conducted to collect feedback from 15 teenage users located in the Chicago suburbs. The study targeted teens' opinions of the application concept, and ways in which they felt the application could be used and/or improved. Teens used the PhotoDispatch application, running on the Chameleon prototype, and were asked several questions about their experience. On the whole, teens were very excited about the application concept, could imagine themselves using it in several different situations, and were curious about when it would be available for purchase. Comments made by teens included:

- "If you had a friend and you were missing them and you wanted to show them, you could just send them a picture, and that's a really cool feature."
- "I'll go to the mall and I'll be taking pictures of things that I want, and I'll be like 'Mom, look!'"
- "It's really cool because you can be like 'oh, who are you with?' and they can be like 'I'm with these people, do you know any of them?'"

Usability Evaluation: Future Work

A usability evaluation will be conducted in which users will be asked to complete representative tasks using a mocked-up prototype of the PhotoDispatch UI – either on paper or using Macromedia Director. Results will consist of usability problems that will lead to changes to the user interface. Tasks will assess the four areas of the application (Acquire, Send, Label and Memory) as well as trying to answer questions such as the following:

- Should the "save" functionality be made explicit, or is it acceptable to save everything automatically?
- Will mode switching be confusing for users – especially the automatic switch to Send that occurs after the user captures a photo?
- Is the Memory management screen too confusing to be useful?

Application Concept

The PhotoDispatch application concept was created through an application brainstorming activity following the Family Communication Study field data collection.

Thing in the middle

- People who are located far apart but still have things to do together (not just stuff to talk about together) can use mediated communication technologies to assist them when they are doing things that require use of a shared object/image/artifact.
 - Problem – I want to talk about a “thing” with another person who can’t share that same thing. (“Thing” is a supplement to the conversation.)
 - Problem – I want to manipulate a “thing” we are sharing.
 - Problem – I want to collaborate with “stuff” but I don’t want to set up net-meeting or scan documents and send them to you, and I want to be able to change the “thing” we are sharing during one conversation. (“Thing is the focus of the conversation.)
- I see a world where I share digital pictures/images (eventually digital home movies?) by sending it home to the cable box (TV) or a little wireless device (panel, tablet) or base of the phone; without anyone going through rigamarole – saving the image, transferring to another device. Can use this idea with our study – recipe’s; travel books (Debbie doesn’t have to go to AAA to get travel book – Trish shares the image with her on a little picture frame). Already set up a connection – want to use this connection to provide all that is needed (don’t have users go through extra steps). It’s a shared experience facilitator. (Can we support the sending/storage of images when the other person is not on the line also? Leave a message – look at the pictures I just sent...) Something that allows people to discuss/view/interact with a common object that is not on the computer. (A tour book – hotel listing guide – whatever.) (Shared experience – and might translate into enterprise solutions.) [Talk to Greg Cox.]

What do we want to share?

- Photos (multiples?)
- Digital pictures (multiples?)
- Clips of digital video
- Recipes
- Page in a cruise book/hotel book
- Doctor’s names and affiliations
- Web page or screen shot
- Contract
- Things that kids make
- Drawings
- Maps
- Page of a book (multiples?)
- Cover of book
- Kids
- Computer parts
- URL

Who is sharing the thing in the middle?

- Friends that travel together
- Friends that have common hobbies
- Parents and Grandparents that want to talk about photos of kids or their artwork
- People who have information needs/resources/expert advice or information
- Vendors
- People who work at home
- Family members/friends who think they know each others’ common interest

Why are we sharing it?

- To discuss it right now.
- To send it to you, or get it from you without hassle.
- To show you.

Supporting Data

Data on users, tasks, and environments supporting the PhotoDispatch application concept was gathered from unrelated studies, in order to inform brainstorming of functionality the application should support.

From MUKRL Wireless Access & Application Research Labs Discovering Future User Requirements: Teens and Imaging

Author: Genevieve Conaty

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Finally, they said that when they take pictures with digital cameras they send those around as e-mail attachments to each other. For example, one teenager said, 'After going out to places with friends I can e-mail digital pics to everyone.' Another teenager mails digital pictures back and forth with her brother. However, one person preferred hand[ing] pics to people on disk' rather than using e-mail.

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The teenagers shared lots of other objects with each other, including videotapes, books, magazines, and especially CDs. The teenagers know which friend might be interested in which particular band or author so they know who to lend things to. The issue of keeping track of who has borrowed what and hasn't given it back was mentioned as a problem.

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Taking Pictures and Printing Them Out. The photos that they took and printed out showed that, just as with the disposable cameras, they most often took pictures of people (63 out of 70 pictures). Unlike with the disposable cameras, however, these pictures of people were most often only of one person's face (51 out of 70 pictures) (Figure 15). Many of these pictures appear to have been taken by the user of him- or herself. None of the pictures showed more than two people (Figure 16). This focus on a single person's face shows that the capabilities of the camera itself and other physical constraints affect the subject matter of the photo; in this case, it seems that the small screen/ image size of the camera didn't really pictures of more than allow two people if the users were taking the picture of themselves and thus could only move the camera to arm's length. Taking pictures of other people allowed more information to fit into the frame (Figure 17).

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One of the teenagers' favourite things about the Game Boy was that the pictures could be printed out right away, several times, for "free," and didn't have to be developed or downloaded to a computer as with a normal digital camera. They printed the pictures out and put the printouts in particular places. For example, as a joke, one group of friends took a picture of a girl who liked a particular boy and then put that picture on the steering wheel of his car as a kind of flirting. Another girl took a picture of her boss and put it on the phone at work to embarrass her.

They printed lots of copies of images for friends. Some people specifically requested that a photo be taken so they could have a printout. They printed more than one copy of many pictures to have copies for different people.

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The teenagers, a few in particular, also had experience using digital cameras. One person mentioned that he likes digital cameras because it doesn't cost as much to make new copies. 'Paper is expensive,' but that's OK because 'hey, it's only paper'; it's 'easier to ask' for a copy of a picture you like because 'it's not an errand' to get another copy. The perception is that digital imaging is 'almost completely free – easy and cheap' compared to normal and disposable cameras.

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A special case of this type of image-based communication was sharing information about romantic relationships. For example, 'this is my man,' 'new boyfriend,' 'a fit bloke at the pub.' The girls mentioned that they have already done this with digital images in e-mail; one girl sent a message to another with a picture of a boy she thought the other would like. One person laughed about this idea and said, 'We'd spend all our time doing this!' Another girl had idea for another flirting-related use of images, in which someone "beams" you their phone number along with a picture of themselves. When they call you later, their image appears so you can remember who they were if you can't remember the name or number.

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Shared Real-Time Photo Editing. The Game Boy part of this study highlighted the example of two teenagers who edited pictures of each other in real time as a way to tease one other (one-upmanship). This application could be replicated over a network connection and turned into a new type of multimedia-based communication. For example, one user could start by adding ridiculous features to a photograph of the other. The other user (or several users in a group communication) could add more ridiculous features to the existing image, "correct" the modifications of the other, or start making changes to a new image. The principle of this idea is not different from the type of shared editing capabilities available in such groupware as NetMeeting, but the application to teenagers using wireless devices would be new.

From the Affinity Diagram for the DAP Contextual Design Study

I always need to be available to the customer

We TSC members get back to the customer within 2 hours for a "minor problem"

U4 20. TSC calls the customer back within two hours if an ongoing problem is categorized as minor.

I have to be always available – I work wherever I am

U2 18. TRT members all have pagers and iDEN radios, and can be contacted 24x7.

U4 2. U4 had been on a phone call during his drive to work. When he got in to work, he was already abreast of his first case.

U4 3. A bridge call with the customer was in progress by the time U4 arrived at work. He immediately joined the call.

Sometimes the customers want us there to support them on-site

U2 35. For special events (like NATO conference, analyst meetings, etc.), the customer requests TRT team members to be on site to make sure nothing goes wrong.

We work in a team environment.

We TRT team members work closely together.

U4 6. Insight: TRT members call each other at home to consult about cases.

U4 8. U4 gets work from other TRT personnel. Someone may come in to discuss another case, and U4 may start working on it.

U4 12. U4 works with supervisor to solve problems.

We use speaker phones in our support roles so multiple people can contribute to multiple conversations at the same time.'

U4 9. U4's environment very noisy. Everyone is on speakerphones or in conversations with each other. U4's attention may switch between different activities.

U5 5. TSC members listen in on each other's phone conversations. They come over or yell facts and information that may be useful.

We help each other solve problems.

We check each others work.

U12 14. As they work, the Motorola AOT and U12 check each other's work, visually and verbally. E.g. look to see if a card is seated right.

U15 38. U15 checks the work of U14.

Some of us really care about improving things.

U3 9. U3's job does not strictly include documentation reviews, but since she once was in the same department as Documentation, she does it anyway because she's motivated to get the customer better documentation.

U3 32. Insight: U3 is teaming with documentation to fix problems, not just throwing them over the wall.

U3 20. U3 is champion of a process improvement team on troubleshooting– she's required to spend 10% of her time on this.

We work together to solve problems.

We solve problems as a team.

U5 47. Insight: A lot of times it is a collaborative effort to solve problems.

U14 5. U14 and U15 work as a team.

U2 43. Insight: for a "customer support" person, U2 does a lot of supporting of other people – he supports the supporters.
U6 11. Development people sometimes participate in DART conference calls with TRT and the customer.
U3 24. U3 takes part in telephone conference calls between markets and the TRT regarding specific problems.

I need to rely on others, but others have no time for themselves!

U1 42. Insight: U1 needs to rely on others to perform his job.
U2 40. Insight: U2 is super SME for DAP – he acts as a Motorola-customer-wide resource for information. BUT, he has no time to do anything because he's being constantly asked questions.
U1 45. Insight: U1 and the customer depend on each other in order to solve the customer's problems.

We communicate via e-mail

We TRT use e-mail / paging to talk with field. It's our lifeline
U2 22. TRT communicates with field people via Skytel website and email to pagers.

U2 21. U2 feels that he can't live without email.

We DART members communicate with customers directly via e-mail

U15 12. U15 gets special HLR backup instructions from DART in the form of an e-mail.
U6 5. U6 (DART) sometimes communicates directly with customers via email.
U17 39. DART e-mailed SQL commands to the Motorola technical release manager at this location. The commands were used to check the sanity of the HLR on the IDAP.

Sometimes privacy is an issue with conference calls

U15 47. The customer personnel in the control room were listening in on U15's call to TRT. They did not tell U15 that they were doing this.

I feel like a second class customer

U7 20. U7 says that this customer has a chip on their shoulder because they feel that Motorola favors another customer over them.

I get Information from multiple sources to solve problems

Sometimes I don't call TSC right away. I rely on my friends in the field

U13 53. U13 will call other site deployment people for help before calling TRT/TSC.
U7 72. Insight: U7 would rather confer with his co-workers on technical problems than TSC/TRT.
U7 57. Insight: U7 prefers to call his co-workers instead of calling TSC when problems arise.

Sometimes my ad-hoc support network fails me. There aren't enough gurus to go around

U17 9. U17 asked someone else to explain the password command. The information that he received was disastrous.

I need information from other people to get my support job done.

U1 43. Insight: U1 needs more information than is available to him.
U7 29. U7 needs information from the Motorola AOM to get information that he needs to get his work done (OMC IP addr).
U1 8. U1 can access the development group (eg. DART) in order to get more information about a specific problem.
U6 7. When U6 gets paged with problems, he calls TRT back to get more information.
U17 43. U17 called a Tandem guru to find out if he could skip a step in the MOP.
U17 31. U17 calls DART to learn that the DAP application does not need to be restarted after the GT4 file changes.

Past experience is important in solving support issues

U5 6. TRT/TSC use experiences from previous problems to decide what solutions to try on current cases.
U1 44. Insight: U1's job is dependent on previous experience.
U1 2. Insight: U1 uses his memory in order to map customer problems with problem resolution alerts.

From the SMWG Use Cases Document

Multiple officers are dispatched to an incident in which a Vietnam Veteran with a history of mental illness is threatening to use a rocket launcher on anyone who approaches the house he is in. Some officers respond by speeding to the house that the offender owns, some officers respond by speeding to the actual house he is in – his mother's house. In the dispatch center, supervisors are at the command and control station for "hot" incidents,

and all radio traffic and multimedia traffic for this incident has been routed to this location in the dispatch office. The first officers on the scene radio that they are "on scene", and take a picture of the house. As other officers arrive, they too take pictures of the house they are in front of. The still images of the houses are downloaded onto the MDTs and are transmitted back to the command and control station. The supervisors at the dispatch center realize that the officers are staging in front of two different houses. They radio out that some officers are at the wrong house, and notify these officers to change their location.

CI Data Support: This scenario aids the officer in collecting and archiving evidence as well as correctly assessing location. Pinellas - the "rocket launcher" incident is a real-life example – some officers ended up in the wrong location. All agencies: officers expressed a desire for an "easy" way to collect information about the scene (traffic accident, or domestic abuse, etc.). They do not currently carry digital cameras and cannot download images to their MDTs. Currently officers sometimes carry 35mm cameras in their patrol cars to take photos of a location or building prior to going to court for a trial.

A call taker receives a call from the Anthropologie store that a man with short blonde hair, wearing a t-shirt and jeans, has just robbed them. The call taker asks the store security personnel to capture a still image from their video of the crime and transmit it to the call center. The still image of the criminal is attached to the incident report and sent to the dispatcher. The dispatcher dispatches two cars, and reads the description of the incident over the air. She sends the CAD incident report to the officers she dispatched, and they are able to view the still image that is attached. As other officers radio in that they too are responding to this incident, the dispatcher puts their numbers into the CAD incident and the CAD automatically sends these officers the incident report with the image of the criminal. As the officers arrive on the scene, and patrol the surrounding area, they are able to use the image as a reference point. One officer sees a blonde male with a t-shirt and jeans on, but despite the general similarity, he does not look like the man in the incident picture. Another officer, three blocks away, sees a man with short blonde hair wearing a Boar's Head Saloon t-shirt and jeans walking quickly down the street. This looks like the man in the picture attached to the incident report, and the Boar's Head Saloon t-shirt gives him away completely – for the officer can see a boar's head on the t-shirt in the digital picture on his MDT. The officer is able to apprehend him after a short chase.

An officer is on what he thinks is a routine traffic stop in the city of Chicago. After an Open Query search reveals that there is a warrant out for the arrest of the driver of the car, and the officer has visually verified the identity of the driver from the mug shot attached to the query result, the officer calls for backup and begins to prepare for an arrest. But the driver of the car flees – speeding away from the scene. The officer calls for backup as he is in pursuit, and the dispatcher hears what is going on. In the dispatch center, the dispatcher also has the query results for the wanted individual along with the mug shot. As the dispatcher tones out an ISPERN message about this chase, she also sends the digital image of the violator to all cars in pursuit, and to all units in the surrounding areas. When the vehicle is found abandoned a few miles away from the original scene, the officers realize the violator is now on foot, and trying to blend into the crowded city streets. Since all officers can see the picture of the violator (on MDT or PDT), or can print that picture out (from the MDT printer in their car) they are prepared to get out to begin searching the crowd.

CI Data Support: This scenario provides the officer with actual photos of suspects, eliminating confusion and misidentification due to incomplete descriptions. Chicago: officers were often given verbal descriptions of suspected criminals, but sometimes there was not enough information for the officers to be able to distinguish the suspect from the rest of the people on the busy Chicago streets, and other times the description changed as the event progressed and victims remembered more. All Agencies: dispatchers related that callers' stories changed over time and bemoaned the general lack of reliability of 911 eyewitness accounts.

From the Affinity Diagram for the Family Communication Study

I use communication media to coordinate my travel with others – from planning a trip ahead of time, to last-minute logistics

I fax directions and travel arrangements for others
SHH2 23. At the second interview, Susan told us she faxed her daughter at school the day before: "my daughter went to Texas so I had to fax my husband because he drove out there and I had to, I made the travel plans and then I faxed him the information on how to get him back." [2nd Int., lines 4-6]

We exchange quickie details about the trip we're planning

SHH3 24. On a Saturday: "At 10:45 AM in the morning I got a call from my girlfriend Trish M., she called me on the telephone and we were quick, we only talked about 5 minutes because I had to leave. She wanted to tell me about a trip that we're planning, and what prices she had gotten for the trip." [Voice Mail, lines 27-30] SHH3 5. During the study period Debbie was in the process of planning 2 trips with Trish [see Voice Mail, lines 29-30; 88-90 and 1st Int., lines 52-53].
PHH1 55. George received an email on July 29 at 9:00 AM from Mark, forwarding George some information about the Seattle poetry slam event they were both involved with, and for which they were planning a trip. [voicemail line 38]

Planning big trips for a bunch of us means lots of phone calls to negotiate.

SHH3 92. Choosing which cruise to take seems like a complicated process of coordination for Debbie and Trish – starting with the fact that none of the parties involved. Once they have determined where they want to go, they have to decide how long they want to stay / how much they want to spend, etc. [third interview line 430] SHH3 95. Making travel arrangements for a gaggle of women who are all coming from different parts of the country can be complicated. Debbie said they usually make a lot of phone calls to different travel agents and then go with the one who quotes the best price. Then they all need to schedule air travel individually, and keep everyone informed about when they need to be where. Debbie said, "It's a lot of phone calls." [third interview line 480]
SHH3 93. Disagreements between Debbie and Michelle about cruise details are usually settled by the "eve rybody gives a little bit" approach. [third interview line 448]

We communicate about doing stuff together in the near future: tonight or tomorrow

We're doing something tonight

PHH2 33. Most of Don's communication events were related to making plans to see someone, or telling someone he was on his way over. [Commun. Partners]

PHH2 35. On a Saturday: "I was on the phone with my mom and dad, letting them know I was on my way over, after going to my sister Pam's house." [Voice Mail, lines 23-24]

PHH2 34. "I communicated from my home about 12 noon, letting my parents know I was on my way over to their house in St. Charles in about 45 minutes to an hour." [Voice Mail, lines 47-48]

PHH2 37. Talking about a picture of him on the cell phone in his car, Don said: "On the way to their house, letting them know I'm on my way. Like it's somehow it's important that they know that I'm going to be there at a certain time." [2nd Int., lines 275-276] SHH1 32. Michelle's mom "she'll always call to make sure I'm going to be here..." [2nd Int., lines 205-206]

PHH2 12. On a Friday: "Today at about 10:30 AM this morning I spoke via telephone from work to my sister Pam who is going to be with me at the DuPage county fairgrounds tonight, and so we discussed when to meet, where to meet type of thing." [Voice Mail, lines 7-9]

Wanna do something tomorrow?

PHH2 42. On a Saturday: "The next one I did was at 6:50 PM I called my friend Bob from home, and I just wanted to know what he was doing tomorrow. Wanted to know if he had open plans, we could do something, he could drive his motorcycle over here from Elmhurst, and do something." [Voice Mail, lines 129-132] PHH3 53. Gary talked to his friend Mike at 12:45 PM on July 28 to

coordinate his plans to meet Gary & Ellen at their boat the next day. [voicemail line 69-72]

PHH2 15. On a Sunday: "We'll start with a 9 AM phone call I made to my sister Pam. I called her to let her know just what I was doing today, in case she wanted to join us. This is what we typically do every weekend. We call, check in with each other, to see who's doing what. She happened to be going to a baptismal today so she couldn't join us. We were on the phone for maybe about 20 minutes." [Voice Mail, lines 137-141] PHH3 73. On August 2, Gary sent email at 8 AM to his cousin's husband, Steve, to confirm whether or not Steve would be joining them for golf that Saturday. Steve answered the email by 10 PM, saying he was unable to join them. [voicemail line 280, 283]

People give me info over the phone that I can't remember, so I have to write it down – and sometimes there's nothing nearby to write with

I didn't write down that recipe you gave me, so I call back to make sure...

SHH3 100. Debbie said that Trish's directions were like, "just throw this in, throw that in..." – not exact amounts – so she asked a lot of questions, especially about what it was supposed to look like. [third interview line 553]
SHH3 98. Debbie made a couple of the recipes Trish gave her, but didn't like the way they turned out. She wasn't sure if she had the directions correct, and she had no idea how anything was supposed to look. [third interview line 512] SHH3 99. Debbie said that Trish had verbally given the recipes to her a few times, but that she never wrote them down. She just thought she would remember. Finally the day before the dinner party she had to call Trish and say 'please give them to me just once more'. She felt that Trish was annoyed with her for being so disorganized. [third interview line 526] SHH3 29. Same Sunday 7:45 PM call with Trish "...and then she was giving me some recipes – she had had a dinner party on Saturday night, and I'm having one next Saturday night, so she was giving me some recipes that she had made, and I was jotting them down. And that was basically it, we were just talking about our trips." [Voice Mail, lines 51-54]

I need to take a message, where's the pen and paper???

PHH3 157. Ellen and Gary's health insurance changed, and she called her sister-in-law to find out the name of her doctor to see if s/he was in their new list of approved doctors. Ellen wrote down the answer with the closest thing she could find – a crayon. She doesn't keep pens around because of the little ones. [third interview line 633-637, 648, 656]

We communicate to pass very specific info related to a "project" I'm working on.

I get recipes from you

SHH3 97. Trish gave Debbie some recipes for a dinner party, over the phone. [third interview line 508]

I call to ask you about a recipe I'm making...

SHH3 68. Debbie got off the phone with her mother just before the final interview. They were discussing a recipe she was making for a dinner party the next day – Debbie's mother was telling her about a similar recipe. She then freaked out when she found out how much Debbie had paid for the meat. [third interview line 62-65]

I call you with specific work-related info you need

PHH1 57. George received two phone calls from Mark during the evening of July 29, regarding the grades for Mark's students and George's poetry book. [voicemail line 45]

SHH1 53. On a Sunday: "And then tonight at 8:30 PM I spoke to Mark again. I initiated the phone call because I needed to record grades of his students to submit to the registrar's office at the University of St. Francis which is where I work." [Voice Mail, lines 49-51]

PHH1 164. George taught a couple of classes on Mark's behalf, and one of those classes was "final project day". As a result, George evaluated Mark's students and then had to communicate his evaluation so that Mark could give his students their final grades. [third interview line 172] SHH1 45. Coordination of getting Mark's grades into the registrar's office involved "some quick faxes happening and things like that happening from my end from work to get those grades." [2nd Int., lines 113-114]

I show people I care by sending tangible stuff: cards, music, pictures... it's somehow nicer than email.

E-cards just can't replace the real physical thing

PHH3 172. Ellen buys lots of greeting cards – sometimes with specific people in mind and sometimes not. [third interview line 951]

PHH3 40. When asked about sending e cards, Ellen said that she had tried it but was not as satisfied with the cards she could find online as she is with the ones she finds while browsing at the store. [first interview line 338-344]

Email can be a medium for transmitting pornographic photos.

PHH3 22. When asked about emailing pictures, Gary interjected "stuff goes through the email that you don't wanna see...", implying pornography. [first interview line 164]

I like to show people I'm thinking of them by spending time to pick out a special card or make a CD for them

PHH3 21. Ellen spends time picking out special things to send to people. She said she buys greeting cards \$20 at a time, and emails parts of songs to people. [first interview line 158]

PHH3 174. Insight Ellen likes to buy a whole bunch of cards so she has them available when the mood strikes her to send one or write a letter. She then selects which one she is going to use from her stash.

PHH3 173. Ellen was planning to send a card to Valerie (her long lost friend) and a CD to her friend Michael. [third interview line 972-976]

PHH3 42. Ellen said that she makes CD's for people and sends them in the mail. She was upset when Napster went down because that was where she got most of her material. [first interview line 407-410]

I receive photos both via "snail mail" and email, but I never send pictures to anyone

SHH1 60. Michelle's mother and mother-in-law both send her hard copy pictures, but Michelle does not send pictures to anyone. [1st Int., lines 114-121]

SHH1 59. "I receive a lot of pictures through e-mail. When Mark's mom moved out to San Diego before he moved out there with her to settle her in, she took a bunch of pictures of the home and e mailed them to us." [1st Int., lines 108-110] SHH1 40. Michelle receives pictures through e-mail, and through regular mail, but does not send either. [1st Int., lines 108-121]

Initial Functionality

Once the application concept of PhotoDispatch had been defined, it became possible to brainstorm the functionality the application would need in order to meet user needs as outlined in the concept and specified in the supporting data.

Photo Dispatch

Problem Statement

The *Photo Dispatch* application is designed to support *purposeful communication*:

"I want to show you something RIGHT NOW, wherever I am and wherever you happen to be – it's important, critical or time-sensitive. And it's much better for me to show you than tell you – you'll get a better idea of what's going on here, or what I want to ask you about, or I can answer your question more clearly."

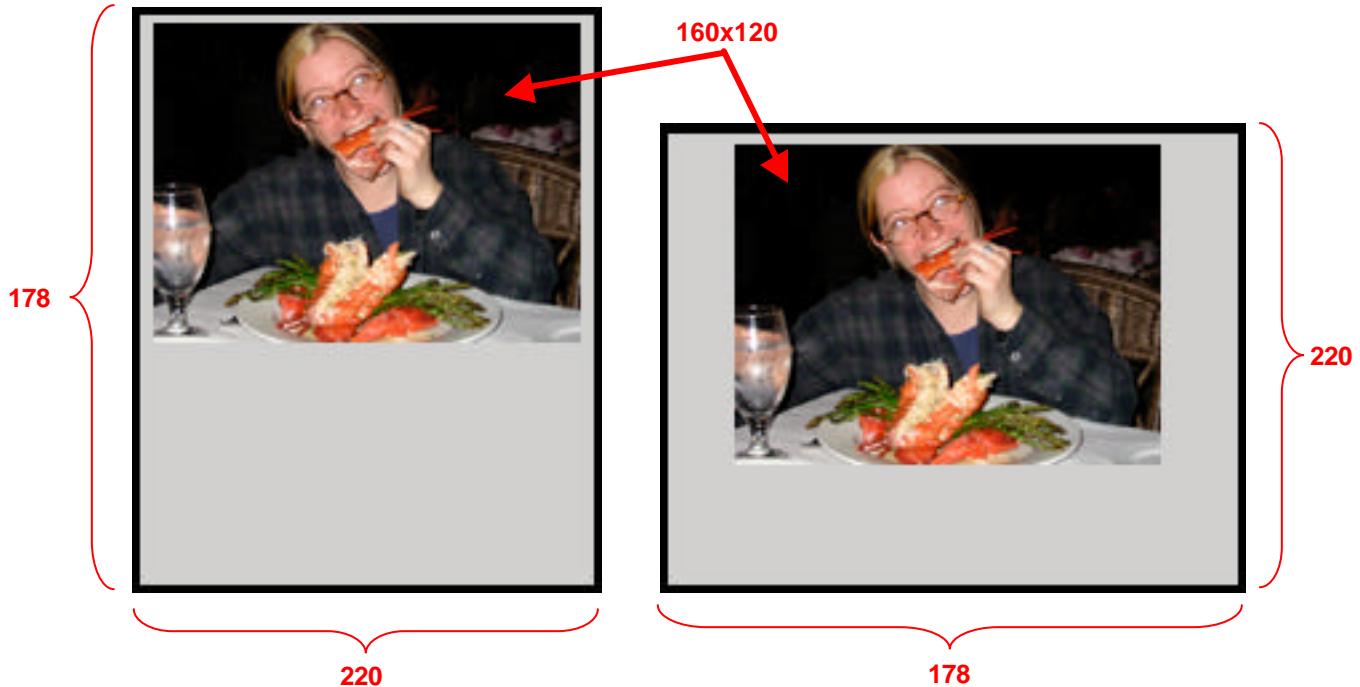
Voice dispatch is not used for long conversations – so Photo Dispatch probably wouldn't be used during a long conversation discussing a large number of photos (with the possible exception of teenage users). In addition, dispatch service is not available across the country, so users would be unlikely to be sending photos long-distance.

Major Interactions – SENDER

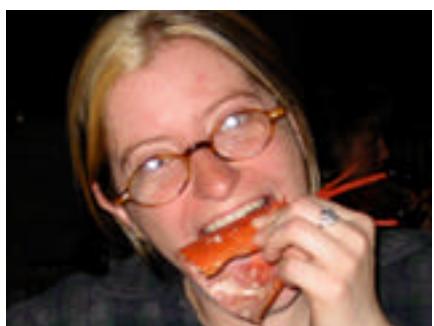
- Capture: (is there a more "camera-like" word for this?)
 - o Trigger: user sees something s/he wants or needs to send to someone
 - o Assumption: only reason user would be launching this application is to take a photo, send it, or view previously captured photos. Start the camera in "capture" mode, allow for quick switch to "view" mode. This is similar to digital cameras.
 - o User launches TIM application, automatically in "camera" mode. Camera is functioning, screen acts as a viewfinder
 - o Available actions: exit / open
 - Exit: quits the application
 - Open: allows user to open a saved photo – changes display to "View"
 - o User moves phone around until s/he sees what they want to capture
 - o User presses button on phone to capture the photo (take the picture)
 - o Additional available actions: cancel / edit / label / contact
 - Cancel: after taking a photo, user presses a button to cancel; deletes the photo and returns display / camera to "viewfinder" status
 - Edit: allows user to do basic manipulation of image, if camera resolution does not match image output/transmission resolution
 - Label: user can add a textual label to the image
 - Contact: allows user to contact the recipient from within the application
 - o Photos are automatically "tagged" with
 - Time/date
 - Sender
 - Capture location (should be able to get this from the system?)
- Label: (should label appear IN the image, or UNDER it?)
 - o Precondition: user has taken a photo that's a "keeper" and that they want to label
 - o Current status of the system: user is looking at the photo they just captured (may or may not have already been edited)
 - o Available actions: exit / cancel / done / capture / send / contact / edit / save / open / view
 - o User pushes button to start entering label; a cursor and line appears w/ a color picker overlay
 - o User selects color and then uses keyboard to type in a short label (has to open the phone the other way)
 - o Should users be constrained to the width of the picture or allowed to wrap text? What about font size / style / orientation? "Flexibility and efficiency of use..."
 - o User presses button to indicate they're done entering text

- Edit:

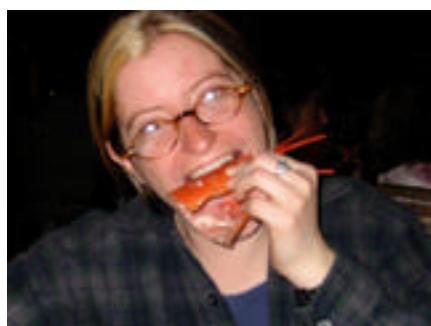
- Precondition: user has taken a picture that's a "keeper" and that they want to send
- This isn't necessary if they're capturing at 160x120; which is the biggest "landscape" resolution that will fit in the screen (which has a resolution of 178x220)



- But, if the capture size is bigger than the display resolution, need to provide an interaction technique to allow the user to pan & zoom until they have the 160x120 pixel selection area that they want to send (this can be a difficult concept for novices to understand). Need to put some careful thought into this so it works just as well for novice digital-photo-takers and experts – and optimizes file size for transmission. So, if the user captures at a greater resolution than 160x120 and intends to send the whole image (like a zoomed-out view, application should reduce the resolution to 160x120 for faster transmission. UNLESS user explicitly sets the preferences such that this doesn't automatically happen – can think of instances where they might want to send the full 320x240 resolution to get more detail in the image even if it can't be viewed all at once.



160x120 section of photo
taken at 320x240



160x120 section of photo
taken at 240x180



photo taken at 160x120

- Using interaction technique, user selects the section of the image s/he wants to send
- User indicates they're done manipulating the image

- Actions available: exit / cancel / pan & zoom / done / capture (?) / label / send
- Contact:
 - Maintain a list of possible non-iDEN recipients, in case user wants to send a picture via email from their phone rather than dispatch
 - Precondition: user has a desire to send a picture, may have an edited, labeled photo ready to go
 - User selects recipient(s), by private ID, from stored contact list, or inputs new recipient
 - User sends request for permission to send image, and/or talks to the person (voice, SMS, beep) and waits for recipient to reply
 - Actions available: exit / cancel / send / label / edit / capture
 - User can speak to recipient while still viewing the image they want to send
- Send:
 - When system receives confirmation that permission has been granted, sends the photo
 - If the recipient is blocking transmissions from the user, the system presents a message to that effect
 - Send incorporates a progress bar and estimated transmission time
 - When the photo has been successfully received, a message appears on the user's device to that effect, or receives a message that something has gone wrong
 - User clicks "done", or "send" to try again if it doesn't work the first time
 - Available actions: exit / cancel / contact / label / edit / capture

Major Interactions – RECIPIENT

- Block:
 - Trigger: user wants to block certain individuals from sending pictures to him/her
 - Similar to "contact recipient" in that the user has to select someone from their list (PID, stored "received from" list – like iDEN sent/received call lists, SMS) – OR – inputs new address / identifier
 - Selects option to block that person
 - Available actions: exit / cancel
- Accept:
 - Trigger: user receives send request
 - User either grants permission (accepts photo) or not; system sends a message to the sender's system telling them they were refused, or the transmission is in progress
 - When the photo is fully received, user's device sends message back to sender to that effect
 - Actions available: exit / save / delete / archive / edit / label
- Contact:
 - User wants to send communication to sender
 - Precondition: user has received something from sender
 - Sender's contact information (PID, SMS, email, etc.) is immediately available due to their recent communication
 - User can speak to sender while viewing the image
 - User can reply to sender with a photo of their own

Major Interactions – SENDER and RECIPIENT

- Delete:
 - Precondition: image(s) exist in memory of device
 - User wants to free up memory by deleting stored images
 - Accesses delete functionality – maybe buried in a menu, like on a digital camera
 - Selects image to be deleted
 - After confirming the selection, deletes the image

- Save:
 - o Precondition: photo appears on screen
 - o After sending photo, or before screen clears, prompt to save (basically any time photo is about to be lost, on new capture, etc.) ???
 - o Also need to provide this functionality through a menu
 - o Use the PalmOS metaphor maybe?? Everything is saved unless you explicitly delete it?
 - o If there's a "save" there needs to be a "browse", especially if a user wants to forward/send an image received/captured earlier
 - o Last "X" number of images are automatically saved, depending on memory, resolution, compression, IF the user has set this as an option
 - o If it's not set to automatically save, then the user must have the option to save AND the ability to open saved images
- Open:
 - o Trigger: user wants to view / send a photo previously taken or received
 - o There won't be many images still on the device, there's not a lot of memory. Can reasonably browse through all of them
 - o But, can also "filter" by tag information associated with image: sender, location, time/date
 - o User scrolls through images until s/he finds the photo they want
 - o Actions available: exit / cancel / delete / edit / label / send
- Archive:
 - o Precondition / trigger: user has pictures on phone that s/he doesn't want to delete, but also doesn't want taking up memory
 - o User can "archive" the photos by uploading them to a web server if they so choose (this would be the personal content store in later versions; I don't want to mess with a complicated interface for this!)
 - o User selects photos to clear out of memory (archive / delete / cancel)
 - o Device uploads photos in the background, user is not forced to wait between photos – and then memory is cleared
- View:
 - o Ability to view images – occurs after capture, send, receive, open, edit, label... default screen from which all options are available

PREFERENCES

- Memory to set aside for photos: how much of the device's memory should be used by the application for saved photos.
- Save sent photos automatically? The application can be set to save sent photos, up to the capacity of the memory set aside for photos. When this memory is full, new photos replace the oldest photos.
- Automatically optimize file size for transmission? If user wants to send a photo that is at a bigger resolution than is viewable, and has not cropped the photo – i.e., they're looking at a zoomed-out photo and want to send the whole thing – the system reduces the resolution behind-the-scenes so the photo takes less time to transmit.

HELP

- User must have help screens for the functionality of this app

Task Flow

Ten Usability Heuristics

Visibility of system status: The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.

Match between system and the real world: The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.

User control and freedom: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.

Consistency and standards: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.

Error prevention: Even better than good error messages is a careful design which prevents a problem from occurring in the first place.

Recognition rather than recall: Make objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.

Flexibility and efficiency of use: Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.

Aesthetic and minimalist design: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.

Help users recognize, diagnose, and recover from errors: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.

Help and documentation: Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

1. Acquire

Description:

Acquire and view image through taking a photo, receiving a photo from someone else, or opening a photo that exists in the memory of the device.

Functions:

- take a new photo (capture)
- receive a new photo (accept or reject)
- open an existing photo (open)
- view an acquired or existing photo (view)
- save photo to memory automatically
- notify user when new photo will overwrite old one in memory

4. Accept

Description:

Provides a mechanism for user control over whether or not a photo appears on their device

Functions:

- receive send request
- grant or deny permission

8. Memory

Description:

Allow for memory management. The device can automatically save all images to the capacity of the memory set aside for this purpose; the user can choose to archive (move images off the device to a permanent location) or delete images in the device's memory.

Functions:

- archive to web, delete, to free up memory
- change memory capacity set aside for the application
- select whether or not overwrite notifications will appear
- select whether or not archiving will happen automatically

3. Block

Description:

Prevent specific person from sending unwanted images

Functions:

- select person to block
- unblock a previously blocked person
- view currently blocked people

6. Label

Description:

Label or "tag" an image with text, but not as much text as a caption. Label is viewable along with the photo on the screen of the device.

Functions:
create label
specify label font
specify label color
specify label style

2. Send

Description:
Conduct verbal communication with another person, and/or send image.

Functions:
select communication partner
includes the capability to easily connect with the most recent communication partner
initiate communication and wait for response
conduct conversation
send image

7. Transmit

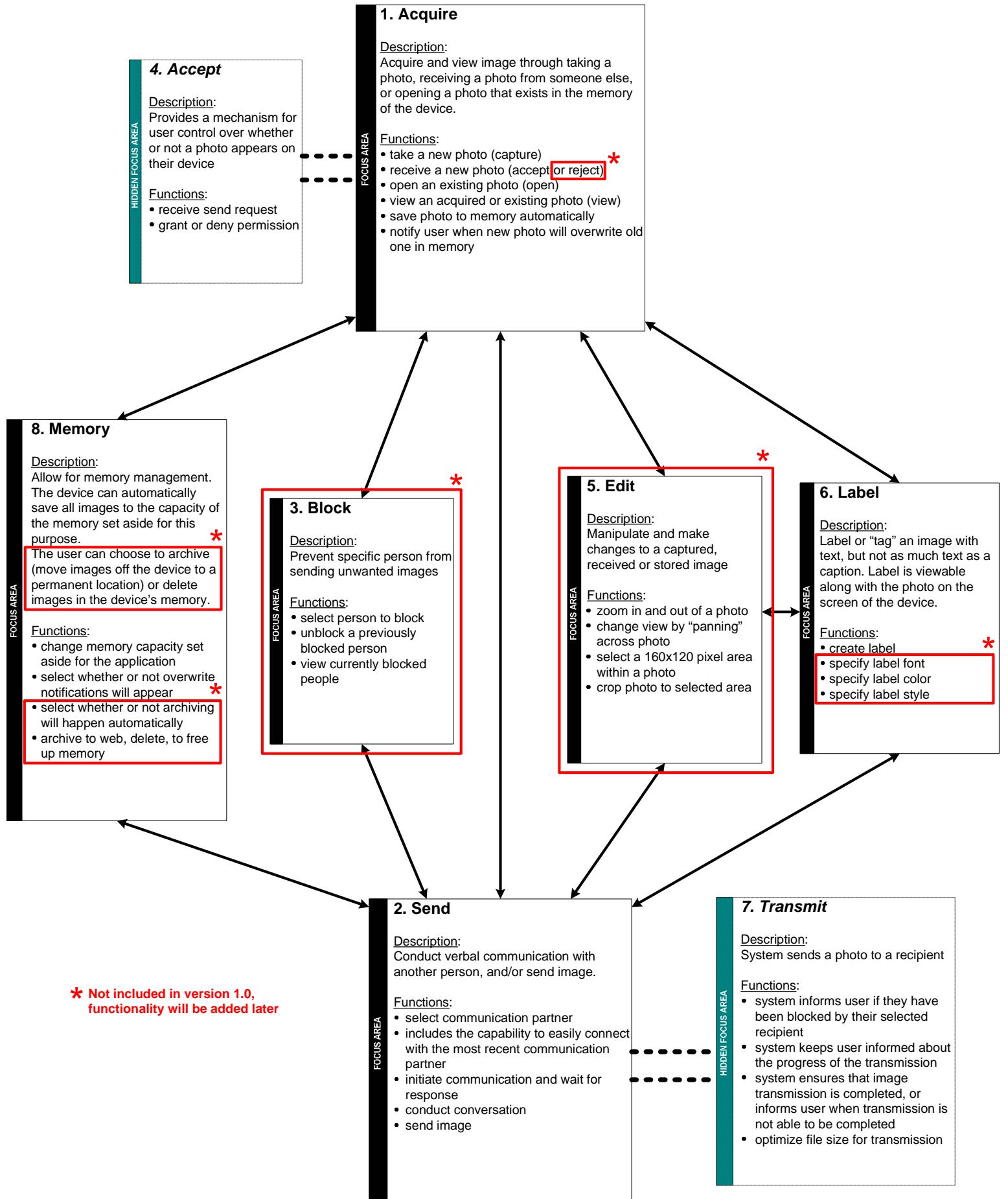
Description:
System sends a photo to a recipient

Functions:
system informs user if they have been blocked by their selected recipient
system keeps user informed about the progress of the transmission
system ensures that image transmission is completed, or informs user when transmission is not able to be completed
optimize file size for transmission

1. User initiates and engages in dispatch call via phone book or dialer
2. Which will launch the photo dispatch application

User Environment Diagram (UED)

The UED is the blueprint for the UI design. It outlines the functions that should be available in the application, and how those functions will be organized. In creating the UED, the question of "How will the application WORK?" is separated from "How will the application LOOK?"



Initial UI Sketches

After the User Environment Diagram was completed and a conversation about what functionality it would be possible to implement took place, rough pencil-and-paper UI sketches were created and refined.

"Push to talk" - ~~not~~ dispated

The application starts in ACQUIRE mode, with the camera / viewfinder active. Every time the user enters ACQUIRE it defaults to active viewfinder

Principles: Keep everything (all actions) visible to the user at all times, and keep as few actions as possible on each screen so it won't be TOO annoying to scroll / tab / arrow through the choices.

Buttons: since there's no touchscreen or functional mouse, the interaction must be done through the keypad.

- ② buttons dedicated for arrow-type keys to scroll through options on the screen

- ① button designated only as the shutter / capture photo key → only in ACQUIRE mode
Something to think about adding later: programmable hotkeys so the user can select dedicated buttons for specific functions

- ① button dedicated only to selecting among the 4 modes / main screens (ACQUIRE / SEND / LABEL / MEMORY)

Similar to the Palm, as users scroll thru actions this must be indicated on the screen using some sort of highlighting. When an action is selected it must "flash" or otherwise provide visual feedback to the user that action has been taken

- ① button ONLY for Select / Enter

- ① button ONLY for Cancel

LABEL: user enters label mode to add a label or view an existing photo w/ label, or modify an existing label. The 'T' icon is highlighted. The user enters the label w/ the Keypad, or uses the "Enter" key which is tied to "Done", or uses the "Cancel" button, or uses the arrow keys to scroll through available options. Need some kind of keyboard shortcut to skip over having to scroll through the entire label before getting to the Done / Cancel actions.

MEMORY: capacity is represented as amount set aside / total memory available, percentage of total still available, & # of photos stored. User can use the Keypad to change the amount of memory set aside for storing photos; these changes are reflected on the line below where the application calculates the approximate number of photos that could be stored at the new setting.

4 basic screens

ACQUIRE

- label
- send
- memory
- * capture
- * open
 - = browse photos on device
 - enter "tag!"
 - sender
 - date
 - time
 - label
 - photo appears

SEND

- label
- acquire
- memory
- * send

LABEL

- acquire
- send
- * create

MEMORY

- acquire
- send
- * capacity
- * ~~outfit~~

CAPTURE

- label
- send
- memory

OPEN

- label
- acquire
- memory

SEND

- acquire
- send

ACQUIRE

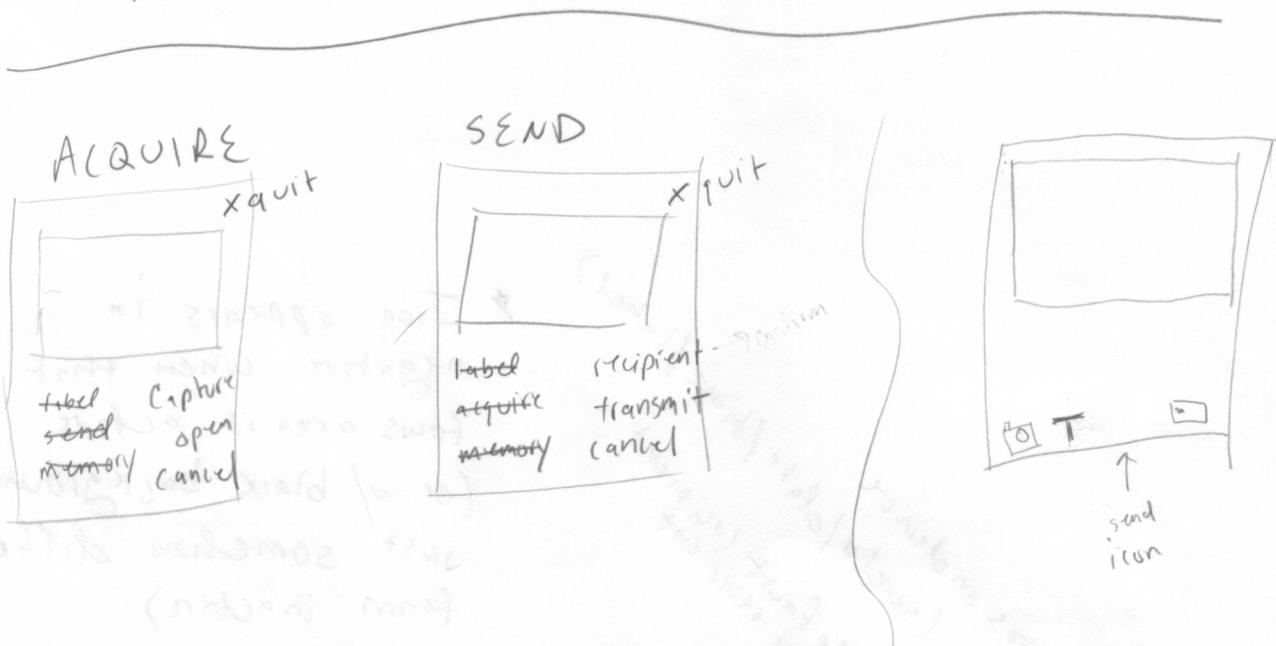
- send

CAPACITY

SELECT RECIPIENT

↳ defaults to
most recent
recipient
dispatch; give
user chance to unblock
or select new

- "Home" like on Palm Pilot is the ACQUIRE screen - should have dedicated button
- "Send" should also have dedicated button
- Chameleon mouse sucks & device has no arrow keys; portrait mode is numerical key pad



How to represent?

- % of total pictures
- # of able to store

DONE CANCEL

For Main Functions

Overlays

- Open (acquire)
- recipient + select (SEND)
- confirm receipt (SEND)
- accept (acquire)

just take it,
image isn't
displayed till
user says OK

browse photos on device
filter by tag (search/date/time/label)
done/cancel
choose new recipient
OK / TRY again

* How does dispatch
work on i90c?

* Iron appears in
negative when that
rows area is active
(or w/ black background -
just somehow different
from Cjnachir)

* Can we support "tooltips"?
does the i90c have a little
mouse thing on it?

A(QUIRE) - capture/open
SEND - transmit/recipient
↓①
dedicated button
↓②
overlay



AQUARI

△ ۳۵۶

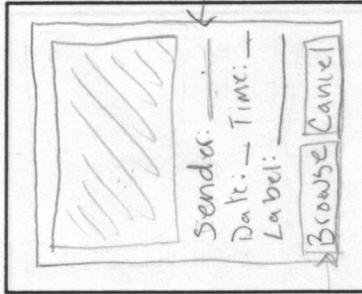
15

LA BÉL

MENOWY

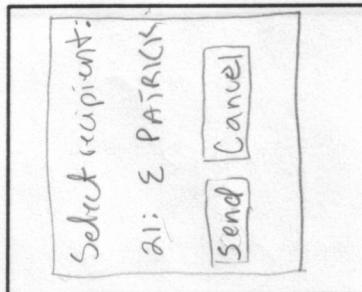


Acquisition (open "paper")

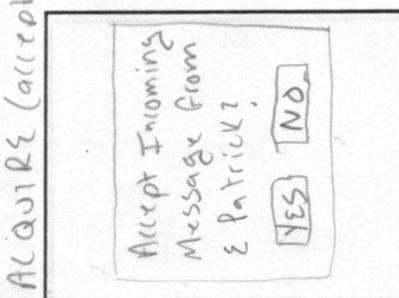


can put in 20dm
but first cap tube

SEND (recipient "popup")



SEND (recipient "popup")



allow long range
surveillance
systems

Acquisition (accept "pupup")

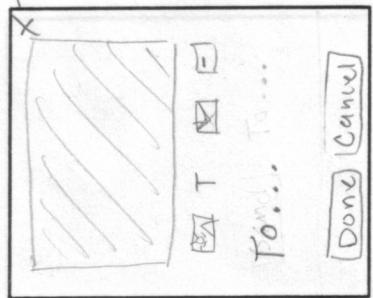


SEND (confirm "pop up")

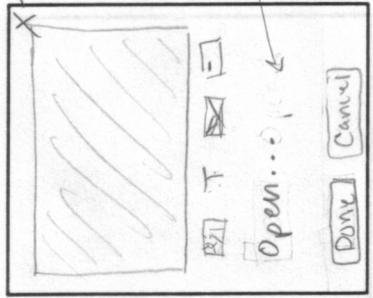
Just take it - image
won't display until user
says OK

"arrow" keys	1 "shutter" - mode change	1 "shutter" - mode change
	1 Select/Enter	1 Cancel

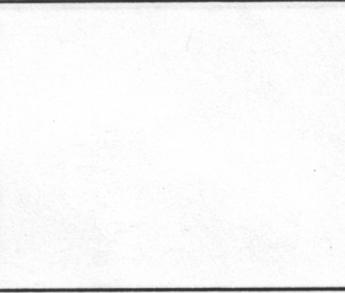
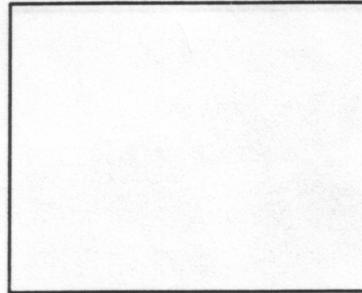
Buttons: 2



—odd
"Caprice"
Key

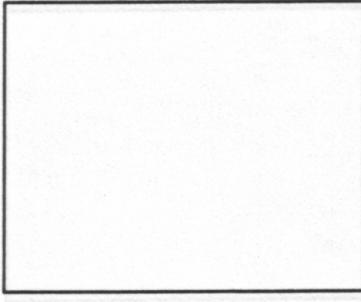
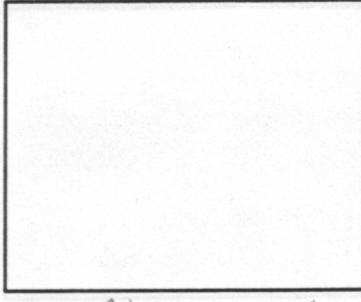
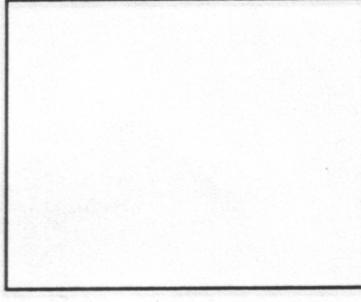
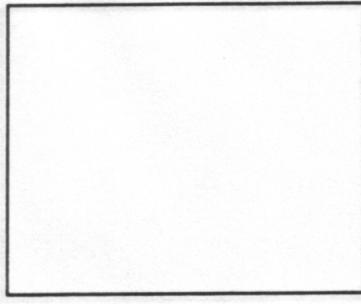
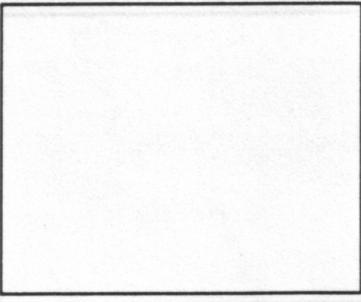
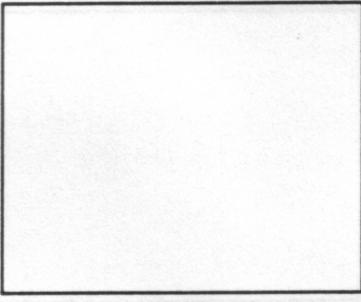
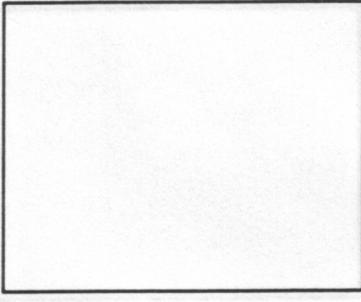
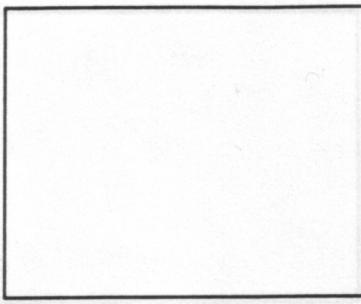
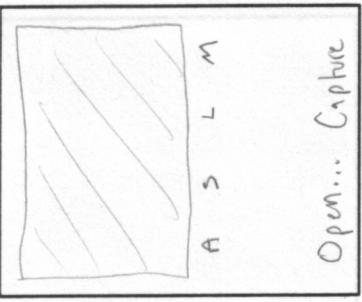


can put in 20dm
but first cap tube



"Shutter" - Notary will take no more
than 15 minutes to do what you ask
Select/Enter | Cancel |

ACQUIRE



(1)

bulk to
w/ new photo

press once to process button
a uniview viewfinder, to get next screen
twice to

take photo.

Taking photo activates "shutter" sound

should be above
to turn sound off
for "streakin"

photos

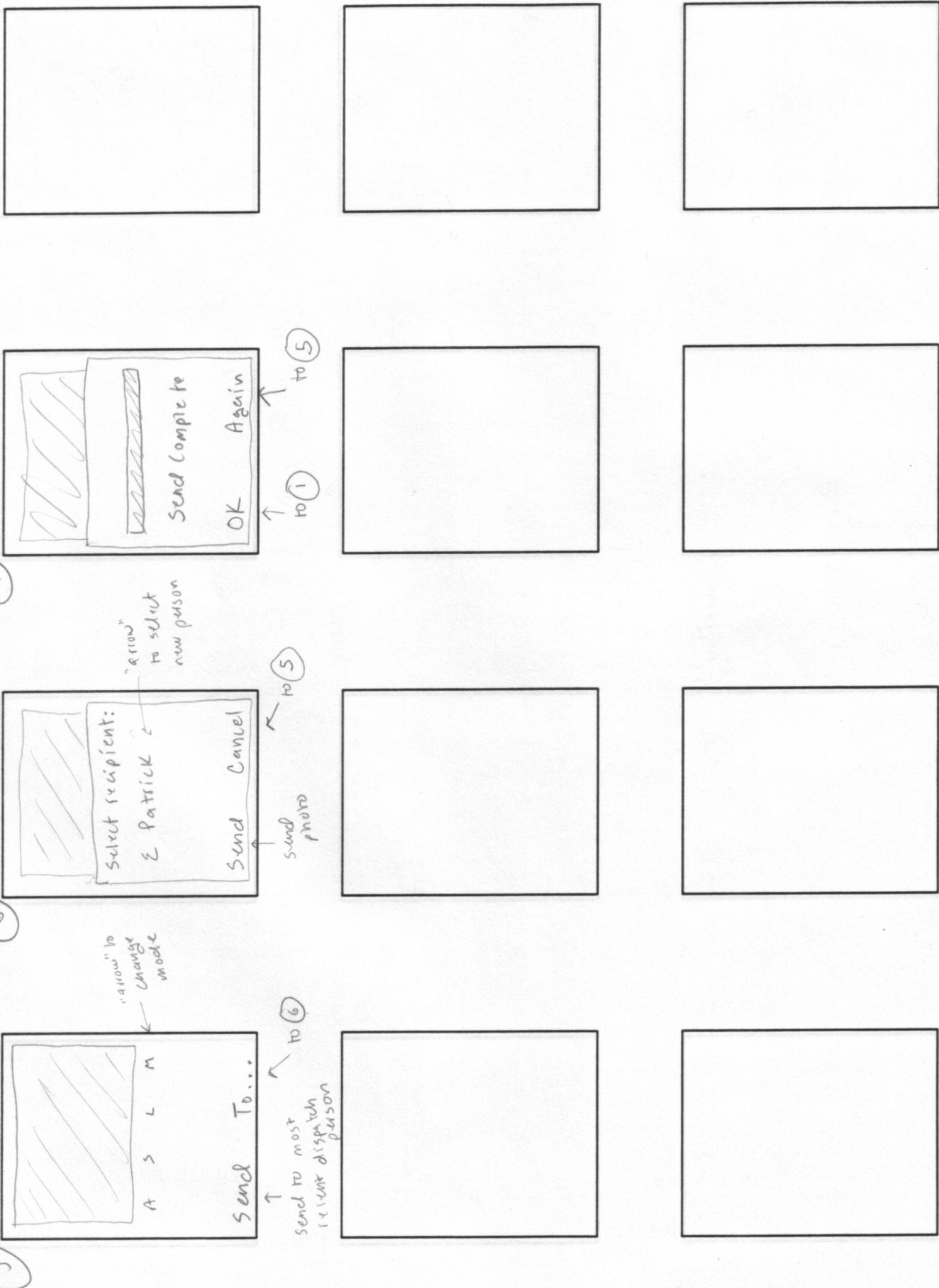
→
you pressing
and view,
and the
map for
drawings,
zooming

SOFTKEYS: map to 2 functions at bottom of display

Arrow Keys, # and *, toggle betw modes & have special functions on "popup" screens

DISPATCH button
SHUTTER hotkey

SUNDAY

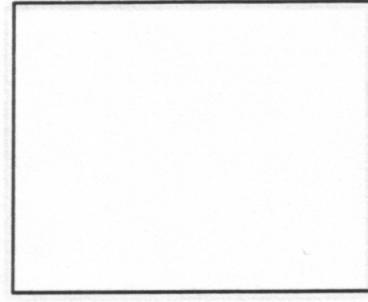
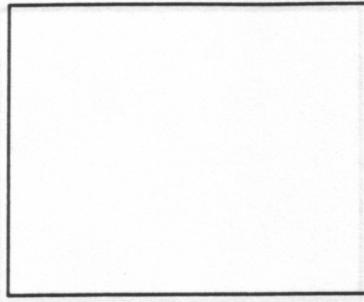
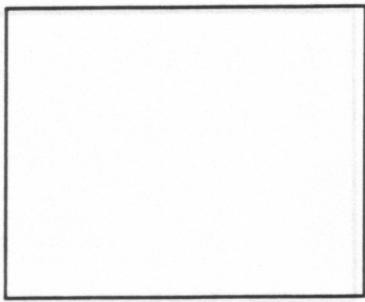


Arrow Keys: # and *; toggle below modes & special functions on "poly"

SOFTKEYS: used to 2 functions {

- at do them if display }
- DISPATCH button
- SHUTTER hotkey

* Outstanding question: Does user need explicit "Done" / "Save" or will plain `Mark完好` (Everythings is always saved) suffice?



DISPATCH SHUTTER button

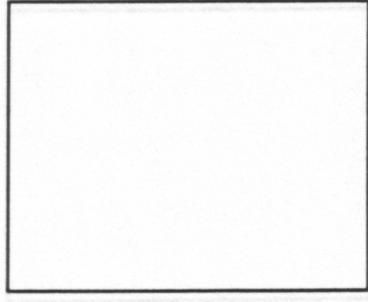
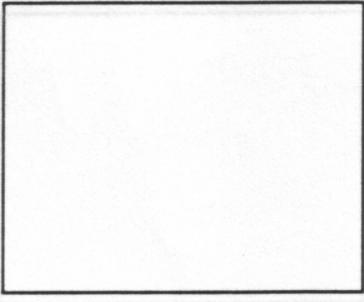
SOFT KEYS: map to 2 functions {
at bottom of display}

Arrows: # and * to go
of special functions

LAGE

9

SEASIDE



∞ a

↑
ba uL uP
eu is uL

one and
uses were

16

6

A large, empty rectangular frame with a thick black border, centered on a white page.

10

→ ∞

↑
ba uL uP
eu is uL

one and
uses were

16
ch

6

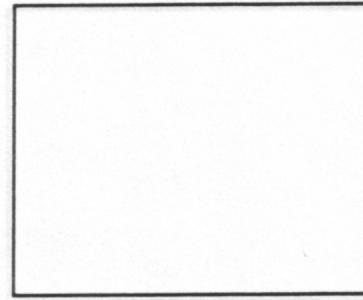
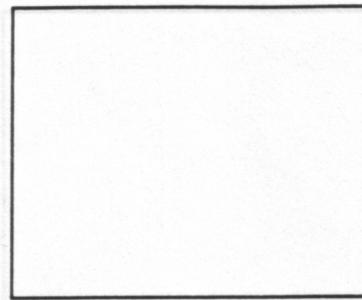
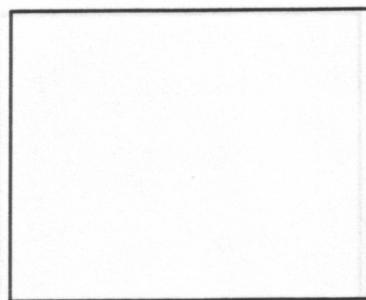
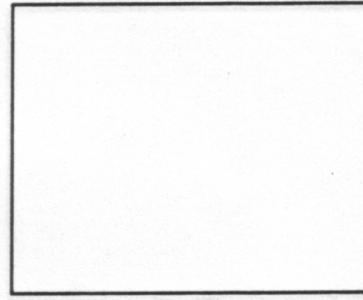
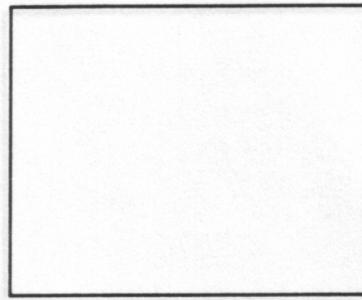
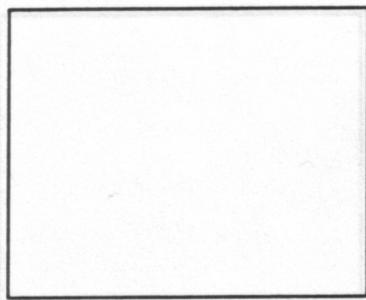
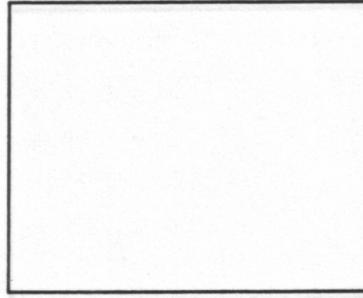
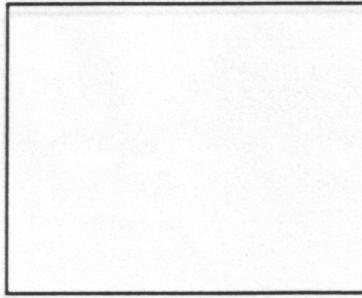
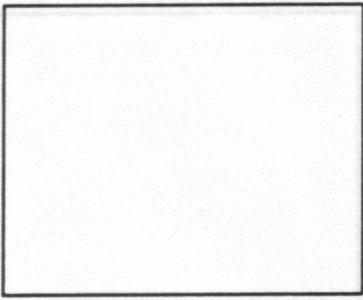
Memory

(10)

Capacity: 654 / 1.2M
Available: 607.
photos: 22

A S L M N
Change to: 65 ↴
(~ 40 photos)
Done Cancel

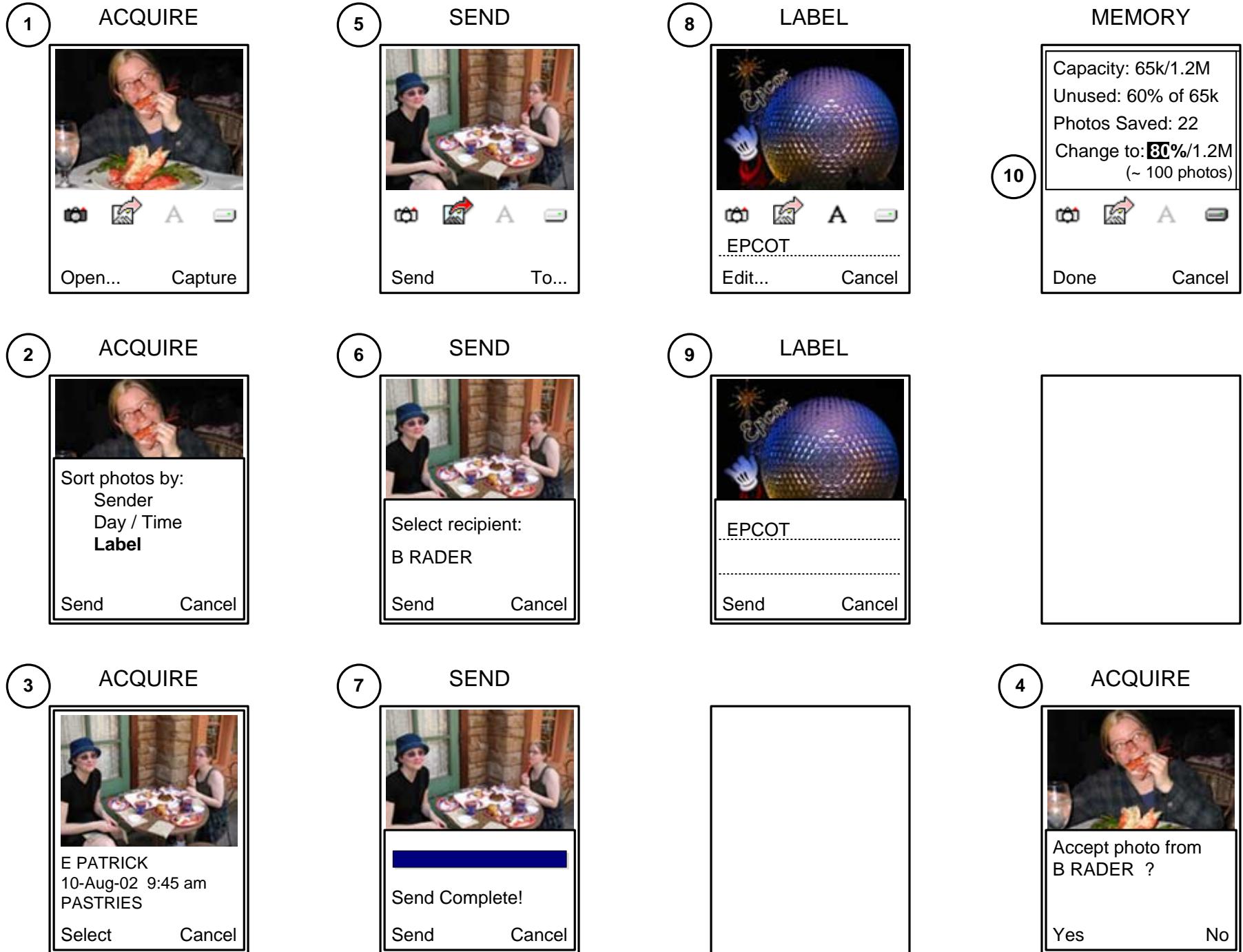
to ① w/o changes
to ② w/o changes
to ③ w/o changes
to ④ w/o changes
to ⑤ w/o changes
to ⑥ w/o changes
to ⑦ w/o changes
to ⑧ w/o changes
to ⑨ w/o changes
to ⑩ w/o changes



Arrows / softkeys / DISPATCH / SHUTTER

Finalized Screen Drawings

Based on design conversations regarding the rough UI sketches, these more formal UI drawings were created using Visio. The PhotoDispatch UI implemented on the Chameleon was based on these drawings.



Screen Captures from Chameleon

The PhotoDispatch UI was implemented based on the finalized UI sketches.
The teen concept study took place using this UI – A usability evaluation is pending.



Init



Acquire



Capture



Captured



Open



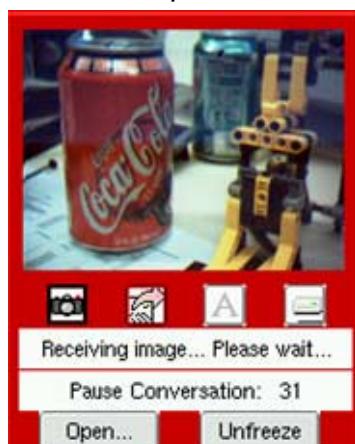
Send



Sending



Sent



Receiving



Received



Label



Sort