Using Video to Support Interaction Design

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Overview

Video is an extremely flexible tool that can capture real-world events as they occur, either "staged" or "live". Video can illustrate ideas and concepts, and especially dynamic events such as how people interact with objects and computers. Video is a creative tool for exploring new ideas, simulating new technology and allowing users to experience technology that does not yet exist. Finally, video is a powerful communication tool, as part of a presentation, in a design workshop, or standing alone, enabling you to share results, discuss ideas and envision future designs.

Over the past 20 years, I have been using video throughout all stages of interactive system design, for both research and product development. This DVD is a tutorial that illustrates four basic video techniques that have proven consistently useful. The tutorial is organized around a deceptively-simple design problem, an 'augmented' Postit™ note. We asked several colleagues to try these video techniques and videotaped them as they designed a solution. Note that they are not actors following a script: they are volunteers using these techniques, often for the first time. These techniques are quick: the interviews here took 10-15 minutes each, the video brainstorming and prototyping sessions took 2-3 hours, and the walkthrough took less than an hour. If you have a video camera available, you can incorporate these techniques easily into any existing design process and increase the quality of the information you gather and the ideas you create. We hope this DVD proves that video is not only powerful, but can also be fast and easy. Just as a graphic designer sketches with a pencil, an interaction designer can sketch with video.

The DVD consists approximately one hour of video clips that show real interviews, live brainstorming and prototyping sessions, followed by an actual design walkthrough. You can also print PDF files that explain each technique with accompanying worksheets. We also include sections on technical tips for using video, ethical considerations, particularly informed consent, and an annotated reference list. The DVD is designed to be used either in a classroom or as a stand-alone tutorial. Please do not simply watch these techniques: try them yourself, on real design problems.

Printable files

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Project: Interactive *Post-It*® Notes

Post-It® notes were invented by accident, a classic case of user innovation. Researchers at 3M Corporation normally spend their time trying to invent *better* glues, that adhere to a wider variety of surfaces. When one researcher happened upon a formula for a glue that did not stick well at all; it was perceived as a failure. However, one of his colleagues had an idea: why not use this not-very-sticky glue on the small scraps of paper he was using to mark songs in his hymn book at church? The *Post-it*® note was born. (What it took to bring it to market is another long and interesting story.) Today, *Post-it*® notes come in a variety of sizes, colors and shapes and are considered an essential office stationery supply. *Post-it*® notes are both simple and powerful, and users are very creative with them.

Project Description: The goal of this project is to design and implement an electronic equivalent or enhancement to a paper *Post-it*® note. Begin by observing how people use paper *Post-it*® notes in a real-world setting. Then analyze your data, in the form of a use scenario, to identify user requirements and new functionality. Next, brainstorm ideas, illustrating how users might *interact* with a new form of *Post-it*® note. Based on the user observations and brainstormed ideas, design and videotape a design scenario that illustrates a new form of *Post-it*® note. Finally, conduct a design walkthrough to gather constructive criticism of the design.

The following questions will help your analysis:

- Why do people write *Post-it*® notes?
- Do people write text? Graphics? Something else?
- Who writes *Post-it*® notes? Who reads them?
- Where do people put *Post-it*® notes?
- Are they ever moved? When, how often and why?
- Are they ever modified? When, how often and why?
- Is there a typical life of a *Post-it*® note?
- How are they created? Modified?
- Are there different types of *Post-it*® notes? If so, what distinguishes them?
- What aspects of an electronic *Post-it*® note might be better than a paper version?
- What aspects of paper may be lost when moving to an electronic version?

Functionality: You have two options. The first is to create an on-screen electronic *Post-it*® note that meets needs of users that you discovered in your (or your colleagues') field studies. The second is to move beyond the workstation and explore a radically-new design, that merges the benefits of paper *Post-it*® notes and the computer (augmented reality). In either case, you need to consider not only the basic functionality (creation, modification, movement, deletion) but also the *context* in which it will be used. The goal is to create a simple, light-weight interface that users can use immediately to address real-world user needs. To be successful, you will need to reflect upon what makes this particular artifact so useful and what aspects of a paper *Post-it*® note should be shared by an electronic version.

Exercises: The following exercises have been chosen because they are very quick to learn and use and because they take advantage of the power of video.

Exercise 1 provides concrete information about what people actually *do* with *Post-it*® notes. Begin by reading about the critical incident and other interview techniques, then find several people who use *Post-it*® notes on a regular basis. Take about 15 minutes for each interview: find out how they use *Post-it*® notes in their offices, and videotape their explanations of why they do what they do.

Exercise 2 involves generating new ideas. Verbally brainstorm a series of new ideas for an electronic *Post-it*® note and then use the video camera to illustrate how a user would interact with them.

Exercise 3 builds on the two previous exercises. Begin by analyzing the interviews to create an illustrative, composite use scenario that describes real use in a real setting. Then, drawing from the brainstormed ideas, develop a design for a new interactive *Post-it*® note. Revise the use scenario into a design scenario that shows how the new system would be used. Illustrate the scenario as a storyboard, focusing on how the user would interact with the new system. Finally, use the storyboard as a guide for creating a video prototype of the new design, as it would be used in a real setting.

Exercise 4 is an efficient way to obtain feedback from various perspectives. Play the video prototype to an evaluation group, then walk through each step of the interaction, getting specific, constructive comments from each participant.

Project groups: Design is a collaborative activity. This project works best with a small group, ideally four people with mixed backgrounds. These video techniques allow all group members to participate on an equal basis and ensure that everyone contributes to the ultimate design.

Supplies: Gather a box of video supplies, so that you can quickly run a brainstorming or prototyping session as the need arises. In addition to flipcharts and overhead projects, include:

- Colored flipchart markers
- Blank transparencies
- Set of transparency pens
- Pair of scissors
- Scotch (cello) tape
- Graph paper
- Blank storyboard paper (A3 size)
- Blank hi-8 videotape (60-90 minutes)
- Assorted *Post-it*® notes
- Colored Sheets of A4 paper
- Dry-erase slate and marker
- Title cards
- Storyboard forms

Interviews: Observing Users

Observing people in the context of their daily work provides important insights into how people actually interact with real systems. A variety of different techniques are possible; this Master Class concentrates on three interviewing techniques that emphasize gathering specific, concrete examples of *Post-it*® note use, as well as "fly-on-the-wall" observation.

Interviews can take a variety of forms, for a variety of purposes. When your goal is to understand how people perform their jobs, it is tempting to ask general questions, such as "Tell me about your job". The problem is that you are most likely to get general answers that describe how the job is "supposed" to be performed. People usually answer in the same style as the question posed: vague questions usually produce vague answers. The trick is how to get specific information; examples that illustrate important aspects of the work. The following techniques help the person being interviewed to think of concrete examples of things that have really occurred.

- **Critical Incident Technique:** Critical incident technique emphasizes a specific, recent incident. Begin by asking the person to envision a particular incident that occurred within the past week. (In general, the more recent the better, since details are important.) The incident can be a situation that was frustrating, surprising, annoying or even funny. Ask the person to describe the incident, including what happened and why it was memorable. Ask for as many specific details as possible, then encourage the person reflect on why it was not typical. Usually, the person will give an example of a breakdown that occurred, followed by a description of the "normal" way things should work. If you are aware of other recent incidents that others have described to you, ask if they know of the incidents or if similar incidents have happened to them.

- **Recalling a specific Time:** A variation of the critical incident technique involves asking the person to describe the events of a specific time and day, say, at 11:00 last Thursday. Even if nothing memorable occurred on that day, the person is likely to explain a 'typical' day; including a number of typical breakdowns. Often, people continue by describing other interesting examples and discuss other kinds of breakdowns that can occur during their work. In general, aim for specific details first, then ask for generalizations. Use this interview technique to contrast the "official" view of the work and with what actually happens.

- **Life cycle of a particular *Post-it*® note:** One of the most useful interviewing techniques when discussing *Post-it*® notes (which do not often lend themselves to major disasters) is to simply ask the person to select an "interesting" *Post-it*® note, usually visible somewhere on the desk, wall or computer screen, and ask for its life history. When did it arrive? Who wrote it and why? What has happened to it since? What is likely to happen to it next? By focusing on the specifics, you can also learn how typical or atypical this *Post-it*® note is, and spark other discussions about related notes and the work practices that surround them.

Interview Exercise

Exercise 1: Videotape an interview, using critical incident and other techniques, to obtain specific information about how people use paper *Post-it*® notes.

Before you start:Plan several questions in advance, including at least one using critical incident technique. Also, think about what background information you need, such as computer experience or length of time in the job. Assume that your questions will change as you get into the interview setting and that new topics will come up. Think of additional questions (Who, What, Where, Why and How) as they answer, to give you more detail about how the person uses the system to support their work. Successful interviews should include descriptions of both "normal" and unusual uses of the system.

Remember, your goal is to get concrete, specific examples first and generalize from there. Try to envision the user setting and make some predictions about possible uses of *Post-it*® notes.

☺ **Decide on Roles:** Before you begin, decide who will shoot the video, who will take notes (the "scribe"), who will ask questions and who will "just observe". These roles are very important and will affect how you perceive the interview. The camera person will be distracted by the mechanics of shooting the video. (Always assume that shooting video will detract from your ability to observe the situation.) The scribe will be thinking about capturing the key elements of the questions and answers, and will get more information from the auditory than the visual channel. The interviewer may also be somewhat distracted by the mechanics of directing the interview. (When you review the video later, think about your role while the video was being shot and what you perceive when you view it afterwards.)

Note that, except for classroom exercises, it is rarely a good idea for four people to conduct a videotaped interview; two is usually best. The interviewer should concentrate on interviewing, taking notes only if possible. The camera person should concentrate on the video.

At the Interview: Plan about 15 minutes to interview someone about their use of *Post-it*® notes. Begin by introducing yourselves and explain your purpose. For example: "We are interested in real examples of how people use paper *Post-it*® notes in their daily work. Would you mind if we spoke to you for a few minutes?" Tell the person how long the interview is likely to last (10-15 minutes).

Always ask if it is OK for you to videotape, even if the videotaping has been pre-arranged, and say what the video will be used for. Some people do not want you to videotape the content of their *Post-its*®. If you have an LCD screen, show them what your camera will see. In any case, explain that it is difficult or impossible to read what is written on the *Post-it*® *notes*. Also, you do not need video of the person, so it's best to let her talk while you shoot the *Post-it*® notes and documents she is referring to.

Shooting: Set up the camera as explained in the video techniques section. Label a new video cassette tape and then shoot at least 20 seconds of the first title card *before you arrive at the interview*, with a voice-over giving the title, date and participants. Shoot a separate title card for each person being interviewed. (Tip: use different colored title cards to make it easier to search the video later for particular interviews.)

After you have explained what you are doing and have the user's consent, you can begin to videotape. Avoid shooting into a light, especially a window. Start with a wide-angle shot of the office area and (slowly!) zoom to the first *Post-it*® being described. After that, try not to move the camera. If you must move, do it steadily and do not use two functions at the same time, e.g., zooming and panning. Use the pause button if you have to move from one part of the office to another. Try shooting from behind the person looking from the side over the shoulder, which gives the user's perspective as they look at and point to their *Post-it*® notes.

After the interview: Thank the person for their time. (This is obvious, right?) Spend a few minutes after the interview reflecting upon what you heard and write down your overall impressions while they are still fresh.

The interviewer should identify which questions were actually used, how they changed and which new questions arose. The scribe should review his or her notes, then fill in any missing details. The observer should write notes and make observations that the others might have missed. The camera person must immediately set the red tab on the tape and label the tape case and tape (use the "original" stickers) with time, date, person interviewed, interviewing team, and setting. (See the "Video Tips" article for more details on videotaping interviews.)

Briefly review your predictions and identify what was interesting or surprising. How did the real setting contrast with your expectations?

Worksheet: Interview Questions

Interviewer: _____ Camera: _____

Scribe: _____ Observer: _____

User: _____ Date: _____

Job description: _____

_____

_____

Critical Incident with a *Post-it*® note: _____

_____

_____

_____

_____

Recalling a specific time: _____

_____

_____

_____

_____

Life cycle of a particular *Post-it*® note: _____

_____

_____

_____

_____

_____

Title

Author

Location

Date

Interview

Topic			
Name			
Location			
Date		Time	

Brainstorming: Generating ideas

Techniques such as brainstorming are designed to expand the design space and encourage you to consider new options and new directions. They also help to determine and redefine the problem, rather than simply solving the first problem that appears. The purpose of this session is to explore the design space and generate as many new ideas as possible, in a form that is concretely and directly relevant to the design project.

☝ **Brainstorming** refers to strategies for generating innovative ideas. The basic procedure involves 3-7 people who are given a topic and a limited period of time. One person writes down every idea on a blackboard or flip chart. Another variation has everyone write down ideas individually, then shares them with the group. The moderator ensures that comments are constructive and that the time is spent generating ideas, not evaluating them. The moderator is also responsible for ensuring that the session finishes on time. The time limit is very important: brainstorming is very intense and, if done well, will leave everyone energized and excited by the ideas, not tired and bored. Brainstorming usually has two phases: the first for generating ideas and the second for reflecting upon them.

In phase 1, everyone suggests ideas, no matter how impractical or silly they seem at the time. The most important rule is: DO NOT EVALUATE THE IDEAS. Statements such as "that's stupid" or "they already did that" are forbidden. What makes brainstorming sessions interesting and fun is the way in which ideas spark other ideas, which is why the rule is so important. To help make people more comfortable and to encourage people to offer unfinished ideas, insist that everyone put in at least one "stupid" idea (without identifying which one it is).

In phase 2, everyone begins to evaluate the ideas. A number of strategies can work, depending upon the goal of the session. If it is important to thoroughly investigate all possibilities, then each idea can be discussed in turn. If it is important to select a small set of ideas that will become the basis for further work, the group can vote on the ideas. Each person goes up to the blackboard or the Flipchart sheets and puts a check mark next to the best (or the top three) ideas. After everyone has voted, the ideas with the highest scores can be discussed. Do not worry about ideas that are not at the top of the list; everyone has been influenced by all the ideas that have been generated, so even minor ideas may become incorporated into the final project.

Video brainstorming is a variation that involves demonstrating ideas for interaction in front of a video camera. The goal is to simulate a wide variety of ideas very quickly and capture them in a way that is easier to understand (and remember) than text notes. In general, raw notes from brainstorming sessions tend not to be very useful after a certain amount of time has passed because the participants no longer remember the context in which the ideas were created. Video brainstorming generates fewer ideas, but they are much easier to recall, since more of the context is captured. Video brainstorming is more likely to be useful at later stages in project design.

Brainstorming Exercises

Exercise 2: Begin with standard brainstorming to generate as many specific ideas as you can about new kinds of interactive *Post-it*® notes. Then run a video brainstorming session to demonstrate how users would interact with the most promising ideas.

Standard Brainstorming: The moderator is responsible for starting the session, ensuring that everyone participates, keeping the tone positive, and ending on time. The goal is to generate as many ideas as possible for a new electronic *Post-it*® note. Include basic simple functions as well as new ideas. Be creative and do not forget to include "stupid" ideas.

Spend 20-30 minutes generating as many ideas as possible. Do not worry about whether or not it is a “good idea”; quantity, not quality, is the goal. Then, re-read the list of ideas out loud and each person should individually select the three most interesting ideas to pursue. When everyone has voted, check to see if there are any clusters of votes. The purpose of the vote is not really to evaluate the ideas. Instead, the goal is to encourage you to reflect on them to help you in the design phase of the project.

☺ **Roles:** Choose a moderator who will direct the discussion and a (different) scribe to take notes. Also, choose someone to monitor the camera. Everyone in the group is responsible for generating ideas.

Video Brainstorming: After reading your ideas out loud to each other, decide which to explore further in video. (Do not argue about this; simply let each person illustrate their favorite idea; their own or someone else’s.) Video brainstorming requires thinking more deeply about each idea than standard brainstorming. Instead of describing the idea in words or with sketches, you demonstrate or act out what it would be like to interact with the new system. However, the goal is to be quick: each participant should be able to videotape several ideas.

Begin by setting up the camera as explained in the video tips section and shoot at least 20 seconds of the first title card at the beginning of the cassette, before taping any ideas. Then, for each idea, tape 3-5 seconds of a title card that includes a brief description, the author, the date and the "take".

Keep each clip short. If you envision a series of actions, they should be captured as separate takes. If you decide to explore several variations of the same idea, each variation is also considered a “take”. Use paper, *Post-it*® notess and transparencies and whatever other materials you like to illustrate how the idea will work. One person is the director, who explains and illustrate the idea to the group (to work out the idea and to practice before shooting). The camera person should videotape title card with the corresponding idea number, e.g., "Take 3". The person directing the idea should perform it again in front of the camera. If the camera person has the idea, the moderator should take over handling the camera. Do not try to edit in the camera, by rewinding the tape and reshooting the idea if you make a mistake. Simply shoot the title card again (modified to say "Take 3 b") and try again. Remember, you want to capture as many ideas as possible.

Worksheet: Standard Brainstorming

Idea	Vote

Worksheet: Video Brainstorming

Take	Idea	Author
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Video Brainstorming

Idea

Author

Date

Take

Prototyping: Creating a design

Designing involves making decisions; pursuing some directions and omitting others. Unlike the idea generation phase, the design phase involves choosing a particular direction and narrowing the range of possibilities. The goal is to explore a more restricted design space, creating a grounded design that is both innovative and still makes sense to real users in the contexts in which it will be used. The purpose of these exercises is to create an innovative design for an electronic *Post-it*® note, in the context of how it might really be used, using scenarios, storyboards and video prototypes.

Scenarios describe a sequence of events, illustrating the activities of one or more people in a real-world setting. The goals are to be realistic, detailed and concise. Since this is difficult to do quickly, it is best to cover only a limited period of time in the scenario. Unlike a task analysis, we are not interested in an idealized description of discrete tasks, nor should the activities be separated into "functions" that can be later be supported by technology. Instead, the goal is to provide a very specific description of what happens, including when interruptions and breakdowns occur. In real product development (and also in research settings), it is essential that people who actually perform these tasks are involved in the discussion: they are the only ones who can provide realistic details about how the work actually proceeds.

We distinguish between *use scenarios*, which are a form of analysis of the interviews and represent what happens today in real-world settings, and *design scenarios*, which are revised versions of use scenarios that illustrate how a new technology might be used. The following is an example of a use scenario derived from several interviews. The names and details of the setting have been changed, but the basic events are real.

Sample Use Scenario: Mary works as a secretary working for a large computer firm. She is responsible for supporting the manager of the marketing department as well as his staff (8 people). It is 9:15 on Tuesday morning and she is reading her electronic mail. Several of the groups that she works with regularly have been moved into a new building across town and they have all changed their telephone numbers. She finds a message from Anne, one of her colleagues and notes the new phone number. She crosses out the old number on a *Post-it*® note attached to her monitor and writes in the new phone number. As she is doing this, the phone rings. One of the marketing reps, John, is on the road and asks her to fax him some market data. He gives her the file name and his current fax number at the hotel. Mary notes this on another *Post-it*® and places it on her phone so she won't forget it. She returns to her email and finds a message she sent herself about a document she needs to edit and return the following week. She saves the file and puts a *Post-it*® note in her calendar that indicates the due date and the file to edit.

Twenty minutes later, Mary gets up to go to the copier to make copies of a presentation her boss is giving later in the day. On her way, she runs into another marketing rep, Joe, who asks her if the expenses have been filed for his last trip. Mary promises to check and borrows a *Post-it*® note from another secretary she knows, June, whose office is next to the copier. She makes a note to remember the expenses, sticks it on the copies of slides she has printed and returns to her desk. When she arrives, she sees that the receptionist has called to say that a package has arrived. She takes off the *Post-it*® reminding her of the expenses and places it on the filing cabinet

that contains the expenses. She then puts a *Post-it*® note on the copies of the slides for her boss reminding him that the presentation is at 15:00. She goes down to reception. The person who called is away on a break, but the other receptionist hands her the package, which has a *Post-it*® note on it saying that Mary has been called and will pick it up shortly.

Design scenarios are essentially enhanced versions of use scenarios, providing an envisionment of how a user's work will change when new technology is introduced. The design scenario should specify both how the users will interact with the new technology in the course of their work and illustrate how it might change their current activities. Just as in a use scenario, it is important that the discussion include people who actually perform the work, since they are most likely to be able to identify problems or unrealistic uses of the new technology. You may wish to evaluate the scenario against a checklist to ensure that no important issues have been left out.

Design scenarios usually begin on paper as text and sketches. They can then be formalized into storyboards, which will help in future videotaping or design workshops. Videotaping the storyboard directly, with a voice-over to explain the action, provides the simplest form of presentation of the ideas. Some film-makers do this, inserting background scenes, music, soundtracks, and actual scenes as they are filmed, to create an evolving document of the state of the project. You can do the same thing as you experiment with implementing different aspects of the scenario, using it as a springboard discussions among designers, users and management. Note that design prototypes can be developed directly from the video prototypes and tested with users in the same way.

Storyboards: Today, most artists and designers who work with temporal information, including cinematographers, video producers, animators, and multimedia producers, "sketch" their ideas with *storyboards*, proving a spatial representation of (usually) linear, temporal information. Storyboards outline the action and capture the key elements of the story. Like a comic book, the storyboard shows a sequence of rough sketches of each action or event, with accompanying dialog (or subtitles) and related annotations including notes about the scene, type of shot, or type of edit.

Storyboards help designers refine their ideas, generate 'what if' scenarios for different approaches to a story, and communicate with the other people in the production (camera, sound and actors or 'talent'). Storyboards can be informal "sketches" of ideas with partial information, created before any video has been shot. Other storyboards follow a pre-defined format and are used to direct the production and editing of the final material. Storyboards make it easy to jot down notes and get a quick overview of a lengthy visual presentation. If the elements of the storyboard are placed on separate cards, the designer can easily experiment with different linear sequences and insert or delete video clips with ease. You can provide a quick overview of what a presentation will look like if you videotape the sketches in your storyboard, with a voice-over explaining the intended action in each clip.

Rapid Prototyping: Developing software is time-consuming and expensive, particularly software that is robust. Prototyping is a way of exploring different design approaches and evaluating specific alternatives. (In this course, we are concentrating on prototyping as a way of exploring design from a user's perspective. But prototyping is, of course, also useful in any aspect of system development.)

Prototypes can take many forms, from very informal paper prototypes, to very elaborate video prototypes with special effects, to working systems. The goal is to create the illusion of real interaction between users and the future system. A good

prototype need not be realistic in every detail, but it should be sufficiently detailed so that users (and developers) can judge what a "real" version of the system would look like. Note that the problem here is generally to discover what the interesting questions are; not necessarily the solutions. Prototypes allow you to explore a design space and try out different ideas, to better understand what the issues are. Implementing an efficient and effective solution can only occur when you have a clear idea of what it is that you are trying to develop.

Prototypes are developed for a variety of different purposes. If the goal is to present information or see how a user will follow a particular procedure, it is often possible to start with just paper. The designer can present screen dumps or sketches to the user and react based on the user's responses to the information on the screens.

- **Wizard of Oz:** Sometimes, it is useful to give users the impression that they are working with a real system, even before it exists. The "Wizard-of-Oz" technique lets users interact with partially-functional computer systems. Whenever they encounter something that has not been implemented (or there is a bug), a human developer who is watching the interaction overrides the prototype system and plays the role destined to eventually be played by the computer. A combination of video and software works well, depending upon what you wish to simulate.

- **Video Prototyping:** In a participatory design process, users of the new system actively participate in prototyping exercises. However, most users are not trained designers. Video prototyping and related methods help users and designers with different skills, interests and responsibilities communicate with each other in a productive way. Video prototyping scenarios show situations that are relevant to users, while providing a concrete specification of what to build.

  Video is very useful for creating a more complex or sophisticated simulation of an interaction. Here, we're using video not as a way to capture events in the real world or to capture design ideas, but as a tool for sketching and visualizing interaction. This technique works best if the video can be projected, either by hooking it up to a monitor or to a video projector. But you can also do it "live" with the tiny screen in the camera. Set up the video camera so that it points either to paper or a partially-working software simulation. Connect the output of the camera to a monitor, seen by a person acting as the user. As the developer, you can present information to the user on their monitor, observe their actions, and respond accordingly. This is most effective if the developer is well prepared for a variety of events and can present semi-automated information. If possible, ask users to participate in a brainstorming session (videotaped) immediately after trying out the video prototype. Let the users try alternatives and suggest different ways of interacting with the system.

Prototyping Exercises

Exercise 3: Develop a use scenario from the interviews. Then, incorporating the brainstorming ideas, develop a design for a new *Post-it*® Note. Create a design scenario, by revising the use scenario: show how a real user would interact with the new system in a realistic setting. Change the scenario and change the design, as needed. Then, illustrate the design scenario with a storyboard and then shoot a video prototype that demonstrates the new electronic *Post-it*® note application in use.

Use Scenario: The goal of this exercise is to describe how a particular (fictional) person uses paper *Post-it*® notes in the context of their work. The scenario must identify WHO is involved and WHERE the activities take place. Be very specific: Give the user a name and describe his or her background and basic job responsibilities. Describe the environment in which he or she works. Use real people as the basis for your description. The scenario should describe WHAT the user does over a specified period of time. Be specific: choose a particular day and describe, step by step, what happens, emphasizing the use of *Post-it*® notes. Use your own experience and what you learned from the critical incident technique interviews to build the scenario. Be sure to include not only things that work well, but also breakdowns and misunderstandings and explain what the user does in response. Include typical and unusual events, as well as positive and negative examples. Think about planned activities and "situated action", i.e. how people respond to the situation at hand, including unexpected events. Tell a story about what happened to this person as he or she used *Post-it*® notes, based on situations that really happened.

Design scenario: Drawing from your use scenario and ideas generated during the brainstorming session, develop a design scenario to envision how the user will interact with your new *Post-it*® note system. It will become apparent that some things work best on paper, whereas others are better handled electronically: change the events in the use scenario to highlight these differences. You are exploring a design space, not coming up with a final solution. Try different alternatives for interacting with your new system. Think about what people will want to do with it. What are the most common and most important functions? Make these easiest to access. As you explore different ideas, think about the design problems they pose. Do you have enough information about your user population or are there questions you still have? What problems will this system solve for your users; what problems might it create? Use real *Post-it*® notes to simulate menus or buttons, use transparencies to show how information on the screen changes. Build upon the isolated brainstormed ideas and systematically apply them to the use scenario to illustrate the interaction.

Storyboard: After completing the design scenario, illustrate it with a storyboard, using one of the alternatives provided. Consider not only the details of how people will interact with your prototype system, but also consider the types of shots you'll need as well as the props and settings. Work out what the title cards should say, as well as what the actors will say.

✂ **Video Prototyping:** Make mockups of the prototype and follow the storyboard. Begin with a title card and shoot each scene in sequence. Keep scenes short, practice at least once, and try to shoot it correctly the first time, to avoid rewinding the tape. Using intermediate title cards, as in a silent movie, will make the story clearer and will make things easier if you find that you do have to reshoot a sequence.

Worksheet: Use Scenario

User:_____

Other people: _____

Date:_____ Time: _____

Setting:_____

_____

Scenario:

_____

_____

_____

_____

_____

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Worksheet: Design Scenario

User:_____

Other people: _____

Date:_____ Time: _____

Setting:_____

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Scenario:

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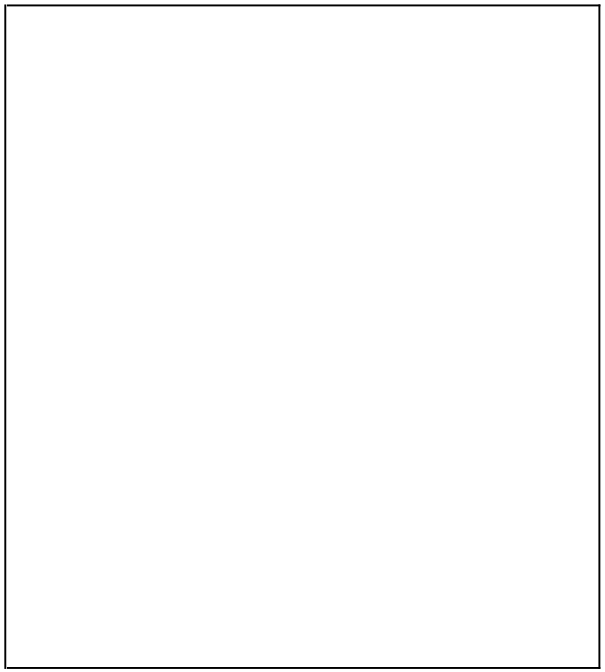
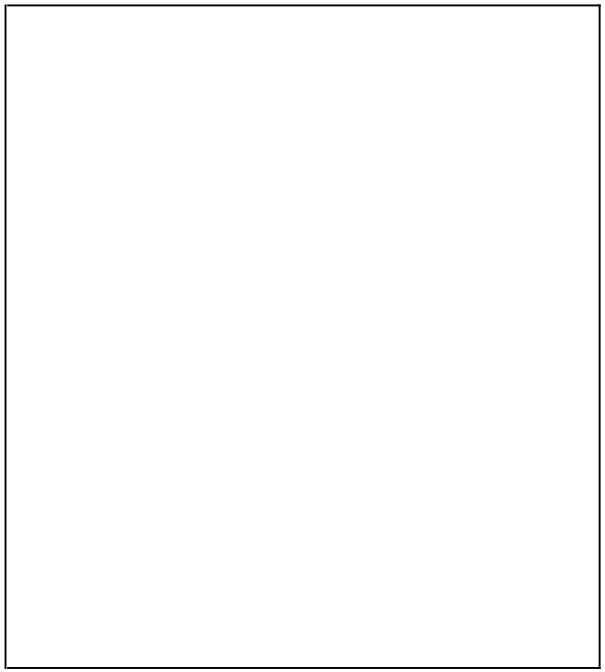
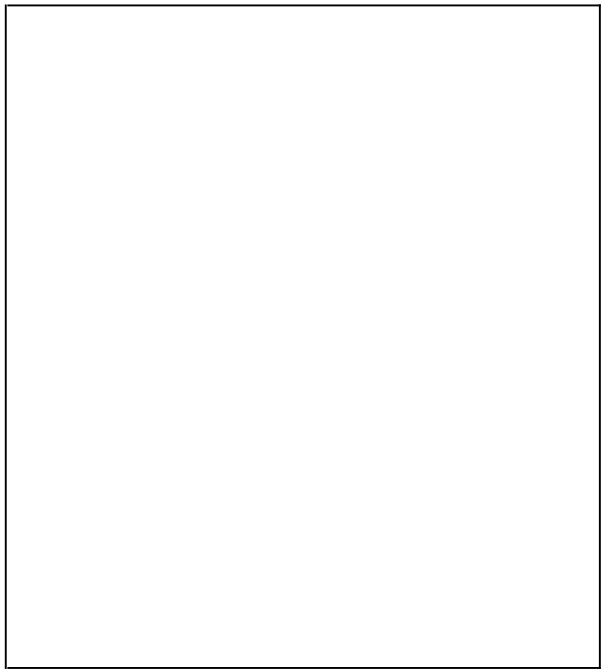
a



b

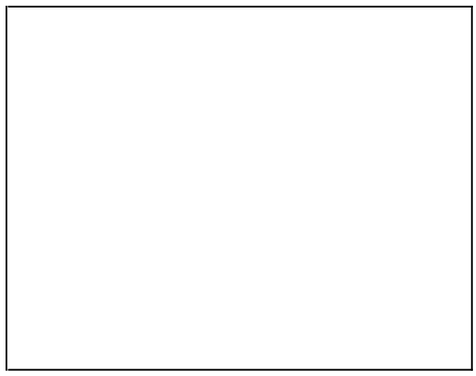


c

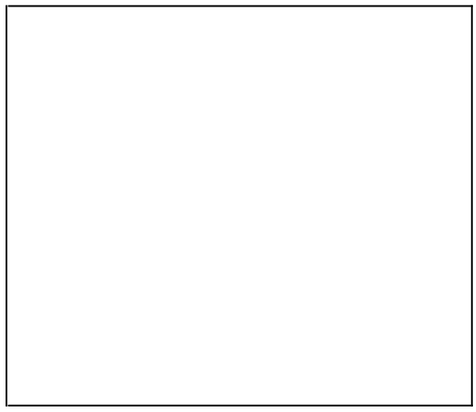


Author: _____

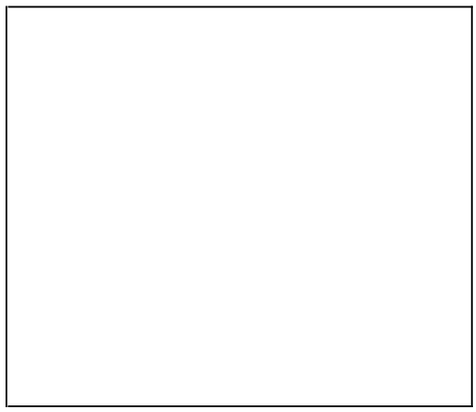
a



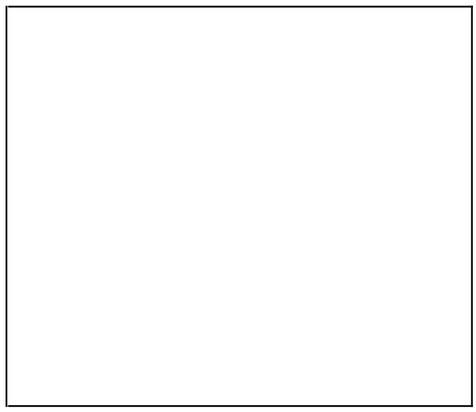
b



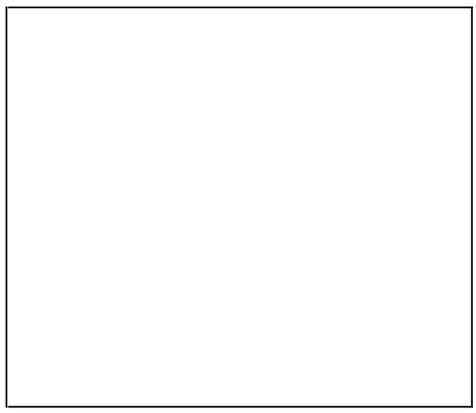
c



d



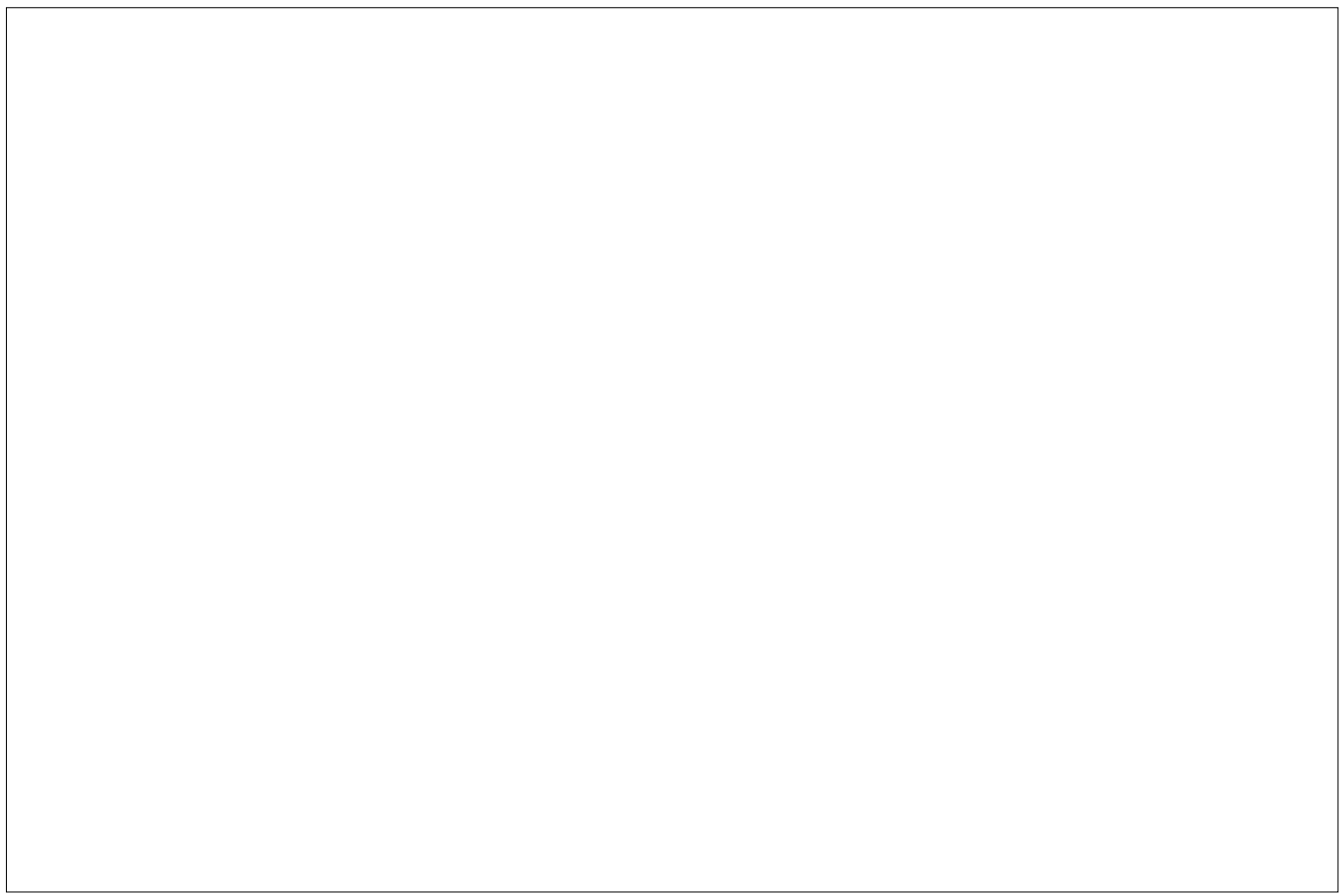
e



Video Prototype

Title			
User			
Setting			
Date		Time	

Credits



Walkthroughs: Evaluating a prototype

Participatory design has borrowed or developed a wide variety of methods for evaluating interactive systems. A key strategy is to involve users in the evaluation process. In addition to standard usability studies and data analysis techniques, video design walkthroughs provide an easily-accessible way for users to participate in evaluation and give feedback that is directly relevant to the design early in the process. The purpose of this session is to identify potential design problems and suggest concrete ways of improving them.

Video Walkthrough A "walkthrough" is a peer group review of a product: people at roughly the same level in the organization meet to systematically review and discuss a segment of software. One can review code, architecture or any aspect of the software. Here, we are interested in the design of the software from the user's perspective. Structured Walkthroughs (Yourdon, 1979) and code inspections have been shown to one of the most efficient and effective methods of obtaining feedback and improving the quality of computer programs.

The rules are very simple, but very important: Groups should be small (3-7 people), members of the group should be at the same level, the presenter should prepare in advance, everyone must be on time and the review should be limited to at most one hour. The goal of the walkthrough is to identify as many problems as possible, not to discuss solutions. Criticisms should be as positive as possible and should be restricted to the design at hand.

☺ **Roles:** In the presentation group, one person should act as the presenter, who explains the basic idea of the scenario and presents the scenario step by step. In theory, you will use the video you shot from the last exercise. If you are not ready, let other members of the presentation group help manage the interaction by manipulating the paper prototype as the presenter goes through the storyboard. The camera person should come from the presentation group. The second group is responsible for evaluating the first group's design scenario. One member of that group should act as the scribe, noting the comments and ensuring that the discussion stays positive.

Exercise Conduct a video walkthrough to evaluate the video prototype. Find several people who have not participated in the design and invite them to help you evaluate the videoprototype. Handing out copies of the storyboard will help participants follow the storyboard and make comments. The presenter should begin by playing the video from beginning to end, then rewind and go through the video prototype, step by step. Participants should ask questions about the design and make constructive criticisms either about specific screens or general usability.

Decide in advance which perspectives members of the reviewing group will take. For example, the user's perspective, technical feasibility, interaction design, and marketability. Do not criticize the authors, concentrate on the software. The presenters should explain, but not defend, their design choices. The scribe should list all the design problems identified. At the end, the group should decide whether the software is acceptable, needs minor revision or needs major revision. Remember: the goal is to identify problems, not correct them. After the walkthrough, participants should hand their notes (on the storyboard) to the presenter, who can revise the design accordingly.

Worksheet: Video Walkthrough

Presenter: _____ Scribe: _____

Start:_____ Stop: _____

Design Issues:

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Video Tips

Think before you shoot!

Editing is time-consuming and often frustrating, so organize your shots before you shoot. (You will also get better footage this way.)

Also, think about who will view the video and plan accordingly. It is far better to record a little video that you will actually watch rather than record large quantities of video that will never be viewed. This is not to say that you should be trying to make a Hollywood movie. You are, however, collecting data and it is important to think about the ways in which you will analyze it later, before you start.

Remember that the camera person is responsible for deciding what to shoot, which means that he or she will not be able to pay close attention to everything that is happening. If you cannot have a separate camera person, do not assume that a camera on a tripod sitting in the corner is just as good. You will have to make an explicit trade-off between a distracted, but intelligent camera person and an undistracted, but non-intelligent camera.

Keeping track: Prepare a label for the tape case and the tape itself. Also, pre-print other title cards so you can use them as needed.

Tape Case: Title, date, activity, participants
Tape label: Title, date, activity, sticker ("original", not “dub” or “master”)

Preparing the tape: Shoot a title card to provide an internal label for your tape, in case the case or external label are lost. Shoot the initial title card for at least 20 seconds with a voice-over identifying the project name, date, activity and participants. You can preprint title cards in advance or hand-write them at the moment, but do not forget!

Setting up the camera: Always try out the camera in advance and be sure you understand how the basic functions work. Most special settings degrade the image, so use them only if necessary. Otherwise, turn them off.

Steady shot	on	Hand-held shots only
	off	Tripod or monitor screen shots
Digital zoom	on	Rarely -- only for long-distance shots
	off	Hand-held, tripod or screen shots
Record light	on	Always - this tells the subject the camera is recording.
	off	Never
Date/Time	on	Only if you you’ll be using on non-Sony players.
	off	Usually
Night shot	on	ONLY in very dark situations with no light
	off	Today’s video cameras operate at very low “lux” - if you can see, so can the camera.

Quick tips:

- For interviews and observations, start with an “establishing shot”, to show the general layout of the office/setting, then focus on the activity itself.
- Shoot over the user’s shoulder so you can see what he/she is discussing.
- Avoid shooting towards a window or strong light source.
- Limit zooming and panning as much as possible.

Videotaping someone sitting at a monitor:

You must decide whether it is more important to see the person or the monitor; since it is difficult to optimize the camera setup for both.

The monitor is tricky to shoot: you are essentially shooting at a large light bulb with a repetitive flicker. Most cameras can only record a quarter or less of the screen, requiring zooming in and out to see the whole screen, or panning from one side to the other. Neither is particularly easy to watch; the viewer very quickly loses the context of what is on screen. If you are recording data (as opposed to recording clips to be edited into a video demonstration or other video presentation), it will be difficult to provide this context. (If you have access to editing equipment, you can cut to a wider view, then cut back to the screen. Zooming back and forth is more likely to make the viewer seasick, unless done carefully.)

You will need a tripod. Turn off all extra camera settings (i.e., no digital zoom, no steady-shot, no night-shot). Even if you do not have a tripod, you should turn off steady-shot; the scan lines on the monitor screen will be less intrusive.

Normally you will need to see both the person sitting at the computer and close-up shots of the screen. This will require some advance framing, to make sure you can zoom in quickly and accurately, without moving the camera. A rule of thumb: You will only be able to read text on the screen if you zoom in to one-quarter of the screen. (Test this in your particular situation, though, since text size can be changed, and monitors differ.)

1. Setup

Place the camera on the tripod at a height slightly higher than the user's head. Normally, you would like an over-the-shoulder view, that, when fully zoomed out, shows the user's head, shoulders, hands and the monitor.

2. Framing

Use the small screen to adjust the framing. Begin by zooming out to the maximum view. Then, practice zooming in to a close-up of the screen. Normally, you will want three basic levels of zoom: full out will show the person and the monitor, medium will show the full monitor, and close will show a readable section of the screen. Adjust the tripod and camera position until you can get these three shots from one press of the zoom button.

3. Shooting

Explain to the user what you are doing and let him or her see what the shot looks like by turning the small screen around. (The image will flip over, giving the correct perspective from the other direction.) If you haven't already taped the title card, do so now. Tape at least 15 seconds if you are at the beginning of the tape.

Begin with an establishing shot, the full-out zoom, to show the person and the monitor. Usually, it is a good idea to have a voice-over explanation of the setting and the purpose of the shot. Try to avoid moving the camera. If it is necessary to move it, do so only in the close-up view and reposition the camera in the standard place before zooming back out. This will be least distracting for the viewer.

Video demonstrations

If your goal is to create a video that illustrates a project or a scenario, plan to edit in the camera. A small amount of planning will result in a much more watchable video.

1. Prepare title cards

Using your favorite text editor, prepare a title card and a credits card. I suggest using 48 pt helvetica text. The title card usually has the project name and date. The credits card(s) contain the authors names and any other relevant information. Try printing or copying these onto colored paper.

2. Prepare the video tape

If you have analog equipment, is a good idea to prepare the tape by recording a blank signal, to make it easier for the camera to make precise edits. Turn the camera toward a wall or leave on the lens cap to get a black image and record for at least 10 minutes longer than you plan the final tape to be. At the beginning of every tape, record at least 20 seconds of the title card. This will enable you to make copies on almost any VCR. If you have a "photo" feature on the camera, you can freeze an image for 5 seconds. If not, shoot using a tripod and tape the title card to the wall or shoot down onto a table. Some computers have a video-out that will enable you to record directly from the monitor.

3. Shooting

Usually when you edit in the camera, record your shot, then press the red button to pause the camera. You now have (about) 5 minutes to shoot again. If you take longer, the camera will automatically stop and release the tape from the heads, making a precise edit more difficult. If you think you need more than 5 minutes to prepare for the next shot, shoot an extra 3-5 seconds at the end of the clip. Before you shoot again, go into player mode (or edit search), rewind, then play forward until you reach the end of the clip. Stop, go into record mode and press "pause". From there, you should be able to start recording again without a "jump" in the tape.

a. Establishing shot

   The "establishing shot" gives the viewer some context. Usually, it's a good idea to avoid zooming. But starting with a wide shot and zooming in to the subject you will be concentrating on can work well.

b. Subsequent shots

   If you will be showing movement, try to practice first, before videotaping, and frame the shot so that the entire movement will occur within the same frame. You can usually do a separate close-up shot later, if you need to. If you plan to show a series of different clips or if you want to make a presentation, prepare a series of slides in advance, like the title cards. Shoot about 5 seconds each (or more if you will be talking over them). If you print these dividers on different colored paper, it will be easier to find the related clips later.

c. Final credits

   Shoot the final credits slide in the same way you did the title card and the divider slides. 20 seconds should be enough.

Ethical guidelines

Video is a powerful medium and easy to misuse. When you ask to videotape people, it is important that they not only agree, but that they understand what they are agreeing to. This is called "informed consent". The goal is to ensure that people do not give their permission for something without understanding the consequences. Getting a signature on a piece of paper is not sufficient. The person requesting consent is responsible for explaining the procedures and ensuring that these procedures, as well as the subsequent use of any resulting information, are fully understood. If the person you would like to videotape says "no", accept his or her answer without argument and find someone else to videotape.

The following basic ethical guidelines are derived from Mackay (1995). The "producer" is the person conducting the interview. The "user" is the person interviewed.

A. Prior to Recording

1. Establish what constitutes informed consent

   Prior to recording, obtain *informed consent*[1]: make sure the user understands the implications of being videotaped. The producer must define what constitutes informed consent. This may be difficult. Explain your purpose in videotaping, what will be shot, who will have access to the resulting video, where and in what context it will be shown, and that their permission will be asked again if the video will be used for a new purpose.

2. Inform people of the presence of live cameras

   If a camera is left on, e.g., in a media space or to record an event, let people know when they are on camera and give them the opportunity to avoid being in the camera's view. A sign should state whether or not the video is being recorded. For example, EuroPARC's media space uses a camera in the commons area. A mannequin holds the camera and a sign to let visitors know they are on camera.

3. Ask for permission before videotaping

   Tell users that a videotape record will be made and give them the opportunity to speak off the record or stop the recording altogether. Consider if the user feels social pressure to agree and make it clear that saying no is legitimate. Avoiding social consequences may be difficult, e.g., when a meeting is taped and only one person objects.

4. Explain the purpose of the video

   Tell users the expected purpose and other potential uses of the video. For example, videotapes from usability studies are sometimes re-used for advertising. Tell users whether separate video clips or the entire session could be used.

5. Explain who will have access to the video

Tell users if anyone other than the producer will view the video. Users may not mind a researcher seeing a tape, but may feel uncomfortable if it is shown to colleagues, managers or general audiences, e.g. at a CHI conference.

6. Explain possible settings for showing the videotape

   Tell users where the videotape could be shown. For example, at CHI conferences, videotapes may be shown to large audiences during talks, in small videotape viewing rooms, or on the hotel cable TV. In some corporate settings, some video clips may be used for advertising.

7. Explain possible consequences of showing the video

   Producers may find it difficult to adequately convey how a user might feel if the video were shown in a certain setting. For example, a video clip shown on a television monitor to colleagues might be acceptable, but highly objectionable when projected on a 40 foot screen to a large audience.

8. Describe potential ways video might be disguised

   If the video will be used in unpredictable settings, describe how the user's image will be disguised, e.g., through blur-ring the user's face. Mantei's (1990) "Strauss Mouse" video is a clever example of avoiding potentially embarrassing use of research videos; she used actors' hands to demonstrate the ways executives misunderstood a 'simple' computer mouse.

B. After Recording

1. Treat videotapes of users as confidential

   Do not allow others to view videotapes casually and restrict access to them. This protects producers as well, e.g., if a manager decides to reuse video in ways that violate the original agreement between the user and producer.

2. Allow users to view videotapes

   Ideally, give the user the opportunity to view the completed video. If this is not possible, the producer should consider ways in which people can be disguised. For example, some video editing systems can blur or distort a face.

3. If use of the videotape changes, obtain permission again

   Asking permission is not a simple matter. Permission can be given before recording or after the user has been taped, or after the user has seen the tape, or just prior to an event in which it will be shown. The user can give blanket approval or approve individual events.

   Give users sufficient information to make an informed choice and let them change their minds. For example, in the CHI'89 Kiosk (Soloman, 1990), users who contributed their images for the conference were again asked for their permission when the database was printed on a CD-ROM.

C. Editing Video

1. Avoid misrepresenting data

   Producers are responsible for editing videos so as not to imply that particular events are representative if they are not. If video is presented as data, distinguish between anecdotal and representative clips of "typical" events.

2. Distinguish between envisionments, working prototypes and finished products

   Clearly label presentations of technology as envisionments, working prototypes or finished products. Envisionments propose or illustrate ideas that have not been fully implemented. Working prototypes have been implemented and should not resort to tricks to make them look more complete. Products are completed commercial systems and must avoid misrepresenting their performance or features. For example, Wellner's (1992) videotape includes clearly-labelled envisionments of future ideas contrasted with working software.

3. Label any changes made to enhance technology

   Show the actual time it takes for a particular operation or else clearly label cuts designed to improve the pacing of a video presentation. Do not simply cut out the slow sections to make your system appear faster.

D. Presenting Video

1. Protect users' privacy

   Hide individuals when possible. For example, shoot over the user's shoulder to see the screen, rather than the user's face. Obviously, this only works if specific characteristics of the user, such as facial expressions, are not an essential part of the record. Consider disguising the user's voice.

2. Do not highlight clips that make users look foolish

   Do not show "funny" clips to make users look foolish. This does not mean avoiding all amusing video clips; just be sure that the joke is not at the user's expense.

3. Educate the audience

   When giving a presentation, educate the audience: do not at the user, explain how misconceptions about the technology can lead to breakdowns.

4. Do not rely on the power of video to make a weak point

   Be careful when showing video clips to support arguments in favor of particular technology changes. Some video clips may magnify small problems or present a distorted picture.

5. Summarize data fairly

   Clearly state the purpose of summaries of video data. Video data can be compressed in a variety of ways. Video clips can provide a shortened version of what occurred in the session or can be used to "tell a story". If clips are presented in random order, they can be combined to show "typical" interactions, highlight unusual or important events, or present collections of interesting observations.

D. Distributing Video

1. Do not use videos for purposes for which they were not intended

   Do not allow video of users to be used for purposes that they are not aware of, e.g. for an advertisement.

Annotated Bibliography

The following books and articles provide more detailed information about the subject areas covered in this tutorial. Use these as resources, but do not be afraid to invent techniques for yourself. Designing interactive software is still a new field, video technology is changing rapidly, and there are many opportunities for finding creative new solutions.

🕮 **Brainstorming:** The basic ideas of brainstorming have been around for a long time. Many of the original books are out of print, but the following two survive. Brainstorming has been adopted by the pop-Business book press, but there has also been extensive research on brainstorming as a technique and debates over which specific methods are most successful.

Clark, C. (1989) *Brainstorming : How to Create Successful Ideas*. CA: Wilshire Book Company.

Wujec, T. (1995) *Five Star Mind: Games and Exercises to Stimulate Your Creativity and Imagination*, Main Street Books.

🕮 **Design Walkthroughs:** Ed Yourdan introduced the concept of Structured Walkthroughs, about the time of the introduction of structured programming, as a way to make the programming process more reliable. I have applied the basic techniques to a variety of different situations, not just searching for bugs but also analyzing overall designs and editing text. More recently, others in the human-computer interaction community have begun to apply these ideas to evaluating user interface designs.

Bias, R. (1991) Walkthroughs: Efficient collaborative testing. IEEE Software. 6(3) pp. 31-36.

Yourdan, E. (1979) *Structured Walkthroughs*. NY: Prentice-Hall.

🕮 **Ethics and Legal issues:** I investigated this topic in Mackay (1995), because I was concerned with the casual attitude of colleagues who used video in their work. My initial training as an Experimental Psychologist caused me to take the side of the "subject", trying to protect the person in the video. Yet when I looked at ethical issues in other related fields, it became clear that different professions seek to protect different people. Thus, journalists are more concerned with protecting the audience and consultants are more concerned with protecting their clients, i.e. the companies that hire them. Since the video techniques here involve activities that relate to a variety of people, we need to think not only about how to protect people, but also who those people are. The following books and articles scratch the surface of the ethics literature, providing examples of either ethical codes or analyses of ethical issues from a variety of professions. I have also included an article by Samuelson, who is the leading legal expert in issues relating to human-computer interaction. It is important to note that just because something is legal does not mean that it is acceptable. Video is a powerful, useful tool that should be used carefully.

ACM Code of Ethics and Professional Conduct, (1993) *Communications of the ACM*, vol. 36:2, pp. 100-105.

Gilbert, J., Tashima, N., and Fishman, C. (1991) Ethics and Practicing Anthropologists' Dialogue with the Larger World: Considerations in the Formulation of Ethical Guidelines for Practicing Anthropologists. pp. 200-012 In.

Ethics and the Professions of Anthropologists: A New Dialog Era. Caroly Fluehr-Lobban, ed.

Forester, T. and Morrison, P. (1990) *Computer Ethics: Cautionary Tales and Ethical Dilemmas in Computing*. Cambridge: MIT Press.

Frankel, M.S. (1989) Professional Codes: Why, how and with what impact? *Journal of Business Ethics*, Vol. 8:2-3, pp.109-116.Shannon, T.A. (1976) *Bioethics*. NJ: Paulist Press.

Hulteng, J.L. (1985) *The Messenger's Motives: Ethical Problems of the News Media*. Englewood- Cliffs, NJ: Prentice-Hall .

ICCP (1989) ICCP Code of Ethics. *Your Guide to Certification as a Computer Professional*. ICCP, 2200 E. Devon Ave., Suite 268, Des Plaines, IL 60018.

IEEE (1979) *IEEE Code of Ethics*. IEEE, 345, East 47th St., NY, NY 10017.Samuelson, P. (January 1994) Copyright's Fair Use Doctrine and Digital Data. *Communications of the ACM*, vol. 37:1, pp. 21-27.

Mackay, W.E. (1995) Ethics, Lies and Videotape. In *Proceedings of Human Factors in Computing Systems, CHI '95* (Denver, CO), pp. 421-422. ACM Press, New York, 1995.

Samuelson, P. (January 1994) Copyright's Fair Use Doctrine and Digital Data. *Communications of the ACM*, vol. 37:1, pp. 21-27.

Stein, H. (1982) *Ethics and Other Liabilities*. NY: St. Martin's Press.

🕮 **Interviewing Techniques:** Social scientists of various backgrounds have developed an impressive collection of techniques for observing people and interviewing them. Miller's Handbook of Research Design and Social Measurement provides a multi-disciplinary collection of research designs and specific examples, including information about conducting interviews and designing questionnaires. Beyer and Holtzblatt provide a more HCI-specific approach, showing how to incorporate input from users (customers) into designs. I have also included three references about the Critical Incident Technique (originally by Flanagan in 1954, more recently reviewed by Shattuck and Woods, with an interesting twist offered by Hartson and Castillo), because it is one of the most useful techniques for gathering information to develop work and design scenarios.

Beyer, H. & Holtzblatt, K. (1998) *Contextual Design. Defining Customer-Centered Systems*. Morgan Kaufmann Publishers

Flanagan, J. (1954) The Critical Incident Technique. *Psychological Bulletin*. 51(4). pp. 327-358.

Glaser, B. and Strauss, A. (1967) *The Discovery of Grounded Theory: Strategies for Qualitative Research*. New York: Aldine de Gruter.

Hartson, R. and Castillo, J. (1998) Remote evaluation for post-deployment usability improvement. In *Proceedings of the Working Conference on Advanced Visual Interfaces AVI'98*. pp. 22-29. L'Aquila, IT. NY: ACM Press.

Miller, D.C. (1983) *Handbook of Research Design and Social Measurement*. NY: Longman, Inc.

Patton, M.Q. (1990) Qualitative Interviewing. In *Qualitative Evaluation and Research Methods*, Sage Publications, pp. 227-359.

Shattuck, L. and Woods, D. (1994) The Critical Incident Technique: 40 Years Later. In *Proceedings of the 38th Annual Meeting of the Human Factors Society*. pp. 1080-1084.

Straus, A. and Corbin, J. (1990) *Basics of Qualitative Research: Grounded Theory, Procedures and Techniques*. Newbury Park, CA: Sage Publications.

🕮 **Participatory Design:** As in many research areas, there are distinct differences between the North American and European approaches to research. "Participatory Design" is the American name for "Cooperative Design", which originated in Scandinavia. Greenbaum and Kyng's book has been influential in moving the Scandinavian approach across the Atlantic. In North American, Suchman's book has been extremely influential in challenging the more structured, task-oriented approach to system design. I've included Norman's books because they are important for understanding the basics of user-centered design and the problems with the design of everyday objects today. The Participatory Design conference, associated with the Computer-Supported Cooperative Work conference, both co-sponsored by ACM/SIGCHI, focuses on recent research and techniques in Participatory Design.

Greenbaum, J. and Kyng, M. (1991) *Design at Work: Cooperative Design of Computer Systems*, NJ: Erlbaum Associates.

Norman, D.A. (1988) *The Design of Everyday Things* New York, NY: Basic Books

Suchman, L. (1987) *Plans and Situated Actions* Cambridge England: Cambridge University Press

🕮 **Prototyping:** Much of the literature on Participatory Design includes references to prototyping, with case studies and examples from particular projects. We have written a book chapter in the *Handbook of Human-Computer Interaction,* which provides greater detail about video prototyping and other prototyping techniques. I have included Tognazzini's and Laurel's books, because they focus on somewhat different aspects of prototyping. I have also included several of the early references on the Wizard of Oz technique (named after the movie), which is now in common use in HCI and Participatory Design.

Beaudoin-Lafon, M. and Mackay, W.E. (2002) Prototyping Development and Tools. In J.A. Jacko and A. Sears (Eds), *Handbook of Human-Computer Interaction*. New York: Lawrence Erlbaum Associates.

Laurel, B. (1993) *Computers as Theater*. MA: Addison-Wesley.

Mackay, W.E. (1986). Beyond the Wizard of Oz. *CHI '86 Conference on Human-Computer Interaction*. Boston, MA: ACM/SIGCHI, Demonstration presentation.

Muller, M., Wildman, D. and White, E. (1993) 'Equal Opportunity' Participatory Design using PICTIVE. *Communications of the ACM*, 36(4), pp. 54-66.

Tognazzini, B. (1993) Principles Techniques and Ethics of Stage Magic and Their Application to Human Interface Design. In *Proceedings of InterCHI'93 Human Factors in Computing Systems*. pp. 355-362. NY: ACM Press.

🕮 **Scenarios:** Scenarios have been around for a long time as a method of developing storylines in film and video production. They have been more recently adopted by HCI and Participatory Design developers and researchers, as a useful method for incorporating aspects of the user's work context into the design process.

Carroll, J. (1995) *Scenario-Based Design: Envisioning Work and Technology in System Development*. NY: Wiley.

Chin, G., Rosson, M. and Carroll, J. (1997) Participatory analysis: Shared development of requirements from scenarios. In *Proceedings of CHI'94, Human Factors in Computing Systems*. pp. 162-179. Boston, MA: ACM.

Mackay, W. & Bødker, S. (1994) Workshop on Scenario-Based Design. In *CHI'94 Conference Companion*., Boston, MA: ACM Press.

Mackay, W.E. & Pagani, D. (1994). Video Mosaic: Laying out time in a physical space. *Proceedings of Multimedia '94* . San Francisco, CA: ACM.

🕮 **Multimedia Data Analysis:** Many researchers have struggled with the problems of analyzing time-based video data. The following articles describe tools developed specifically to handle multimedia data in human-computer interaction. In addition, I have included several key references on exploratory data analysis (Tukey, 1977 and Hartwig & Dearing, 1979), which is particularly relevant to analyzing data captured in field settings. Cook & Campbell (1979) provide an especially thorough guide to designing field studies, including the various "threats to validity" and how to cope with them.

Cook, T. and Campbell, D. (1979) *Quasi-Experimentation: Design and Analysis Issues for Field Settings*. Boston, MA: Houghton-Mifflin Company.

Harrison, B. (1991) Video annotation and multimedia interfaces: from theory to practice. In *Proc. Human Factors Society 35th Annual Meeting*, pp. 319-323.

Hartwig, F. & Dearing, B.E. (1979) *Exploratory Data Analysis*. Beverly Hills, CA: Sage Publications.

Mackay, W. E., & Davenport, G. (July, 1989) Virtual Video Editing in Interactive Multimedia Applications, *Communications of the ACM*, 32(7), pp. 802-810.

Mackay, W.E. (October 1989). EVA: An Experimental Video Annotator for Symbolic Analysis of Video Data. *SIGCHI Bulletin*, Vol. 21(2). Special Issue: Video as a Research and Design Tool.

Mackay, W.E. and Beaudouin-Lafon, M. (1998b) DIVA: Exploratory Data Analysis with Multimedia Streams. *Proceedings of ACM CHI '98 Human Factors in Computing Systems*. Los Angeles, California: ACM/SIGCHI.

Roschelle, J. & Goldman, S. (1991) VideoNoter: A productivity tool for video data analysis. *Behavior Research Methods, Instruments and Computers*. 23, pp. 219-224.

Sanderson, P., Scott, J., Johnston, T., Mainzer, J., Watanabe, L., James, J. (1994) MacSHAPA and the enterprise of exploratory sequential data analysis. (ESDA), *International Journal of Human-Computer Studies*, 41(5), pp. 633-681.

Sanderson, P. & Fisher, C. (1994) Exploratory sequential data analysis: foundations. *Human-Computer Interaction*, 9(3), pp. 251-317.

Trigg, R.H. (1989) Computer Support for Transcribing Recorded Activity. *ACM SIGCHI Bulletin*: Special Issue on *Video as a Research and Design Tool*, 21(2), pp. 72-74.

Tufte, E. (1983) *The Visual Display of Quantitative Information*. CN: Graphics Press.

Weber, K. & Poon, A. (1994) Marquee: A Tool for Real-Time Video Logging. *Proceedings of CHI'94, Human Factors in Computing Systems*. pp. 58-64.

🕮 **Storyboards:** Storyboarding is a technique learned as an apprentice, while learning animation, film-making or some other related discipline. My article below talks about storyboards in the context of an augmented reality system, in which we linked the paper storyboards to an on-line video editing system. The article by Webster is a recent example of a tutorial in a magazine aimed at computer video professionals and explains the basic steps to building a storyboard for animators.

Mackay, W.E. and Pagani, D. (October 1994). Video Mosaic: Laying out time in a physical space. In *Proceedings of ACM Multimedia '94* . San Francisco, CA: ACM.

Webster, C. (December 1998) Animation Master Class: part two. *Computer Arts*. pp. 40-44.

🕮 **Triangulation:** Triangulation is the principle of using different methods to analyze the same phenomenon. If results from the different perspectives match, the likelihood is

far greater that the overall result is correct. Human-computer interaction is a multi-disciplinary field, which draws from various social sciences (Psychology, Sociology, Anthropology) and engineering disciplines (computer science), as well as different design disciplines (Graphic Design, Typography). The techniques in this course are drawn from different disciplines and modified to suit the needs of interaction design.

Mackay, W. & Fayard, A.L (1997a) HCI, Natural Science and Design : A Framework for Triangulation Across Disciplines, *DIS'97 : Designing Interactive Systems*. Amsterdam, Holland.

Chalmers, A. (1994) *What is this thing called Science? An assessement of the nature of science and its methods*. Milton Keynes: Open University Press.

Gray and Salzman (1998) Damaged Merchandise? A review of experiments that compare usability evaluation methods. *Human Computer Interaction*, Vol. 13 (3). (Entire issue)

McGrath, J., Martin, J. & Kulka, J. (1982) *Judgment Calls in Research*. CA: Sage Publications.

🕮 **Video:** Video analysis can be very simple or very complex, depending upon what you are trying to learn. My article below is a practical guide to organizing your video, with some technical information about video itself. The remaining articles offer examples of how experienced researchers approach analyzing their video data.

Davenport, G., Smith, T.A. and Pincever, N. (July, 1991) Cinematic Primatives for Multimedia. *IEEE CGA*, 11.4:67:74.

Mackay, W.E. (1998) Technical aspects of using video. Technical Report, Centre d'Études de la Navigation Aérienne.

Suchman, L.A.& Trigg, R.H., (1991) Understanding Practice: Video as a Medium for Reflection and Design, In J. Greenbaum & M. Kyng (eds.), *Design at Work: Cooperative Design of Computer Systems*. Hillsdale, NJ: Lawrence Erlbaum,

Karasti, H. (1997) Bridging the analysis of work practice and system redesign in cooperative workshops. In *Proceedings of DIS'97, Designing Interactive Systems*.

Koschmann, Th., Anderson, A., Hall, R., Heath, C., LeBaron, C., Olson, J., and Suchman, L. (1998) Six Readings of a Single Text: A Videoanalytic Session, Panel. In *Proceedings of CSCW'98*.

Biography

Wendy E. Mackay received her Ph.D. from the Massachusetts Institute of Technology in the Management of Technological Innovation. She has been actively involved in the HCI community for over 18 years, as Chair of ACM/SIGCHI, Technical Program Chair for CHI'94, Co-Founder of Greater Boston SIGCHI, and program committee member for CHI, CSCW, IHM, ERGO-IA, ESCW, DIS, AVI, Multimedia and other HCI-related conferences. She is on the editorial board of French and English journals and has published over 70 articles in the area of Human-Computer Interaction.

Initially trained as an Experimental Psychologist, Wendy moved to Digital Equipment Corporation, where she was first a programmer and then a manager, ultimately programming or responsible for over 30 multimedia software products, a pre-Hypercard multimedia authoring language and the computer industry's first multimedia system (IVIS). She has managed research and development groups in multimedia at Digital, MIT and Xerox PARC's European research lab in Cambridge, England. She has been a Professor Associé at the University of Paris-Sud in France and a Visiting Professor of Computer Science at Aarhus University in Denmark. She is currently a senior researcher at INRIA in France, working on the participatory design of augmented reality and multimedia applications.

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