05- Methods and Experiments

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Usable Privacy and Security

Engineering & Public Policy

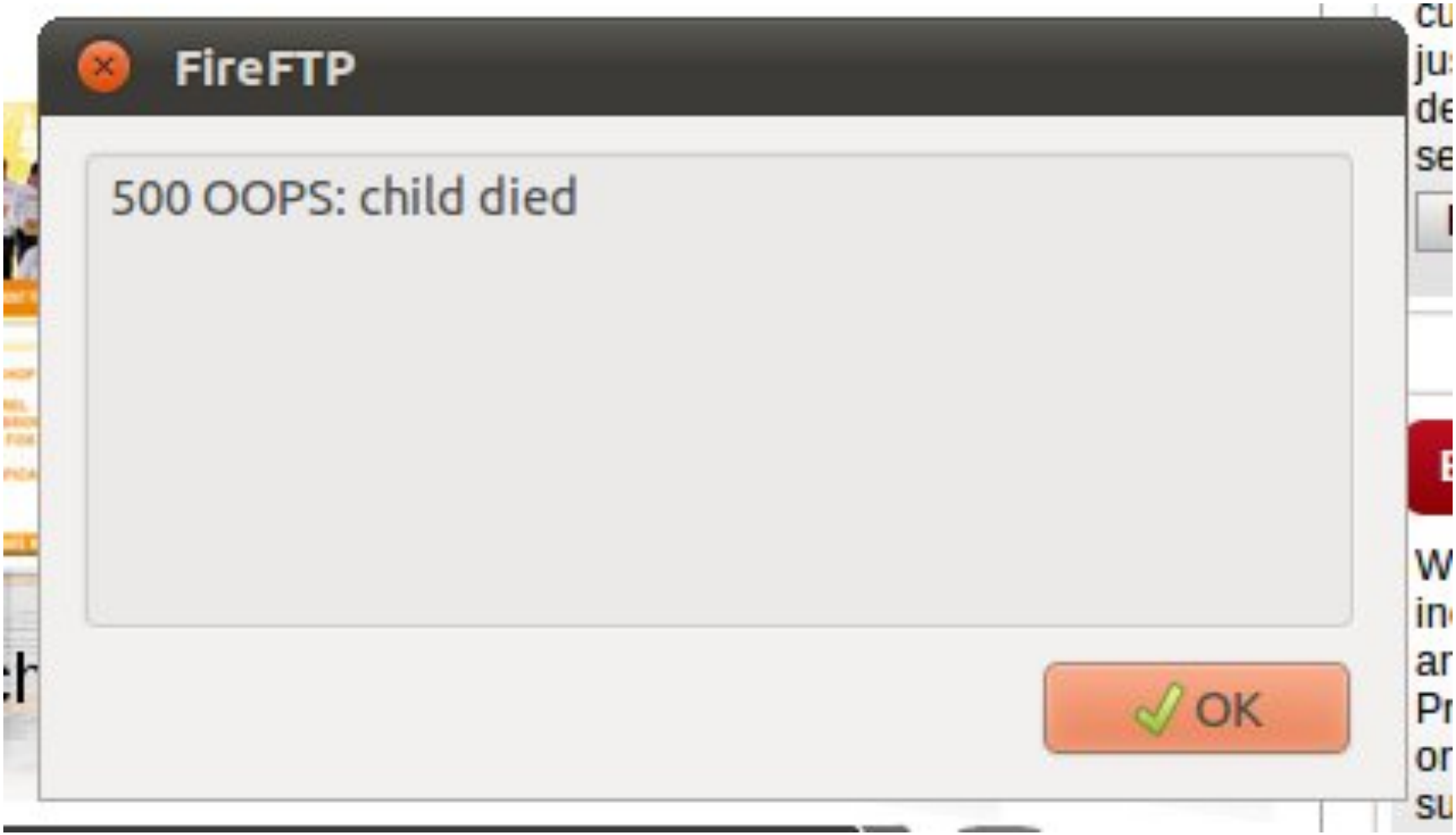
Today's class

- General HCI design methods
- Types of research studies
- Overview of research methods
- Study logistics and validity
- Participant recruitment
- Deception and ethics

Human-Computer Interaction (HCI)

- You are not the user! You know too much!
- Think about the user throughout design
- Involve the user

Human-Computer Interaction (HCI)



What is usable?

- Intuitive / obvious
- Efficient
- Learnable
- Memorable
- Few errors
- Not annoying
- Status transparent

Image from http://www.xkcd.com

Difficulties

- Many systems and platforms
- Users are different from one another
- Required standards (or no standards)
- Documentation won't necessarily be read
- Performance
- Legal / time pressures
- Social and external factors

Determine use cases and goals

- What are the concrete tasks users should be able to accomplish?
  - Based on understanding of users!
- Set realistic metrics

Personas (example)

Name: Patricia

Age: 31

Occupation: Sales Manager, IKEA Store

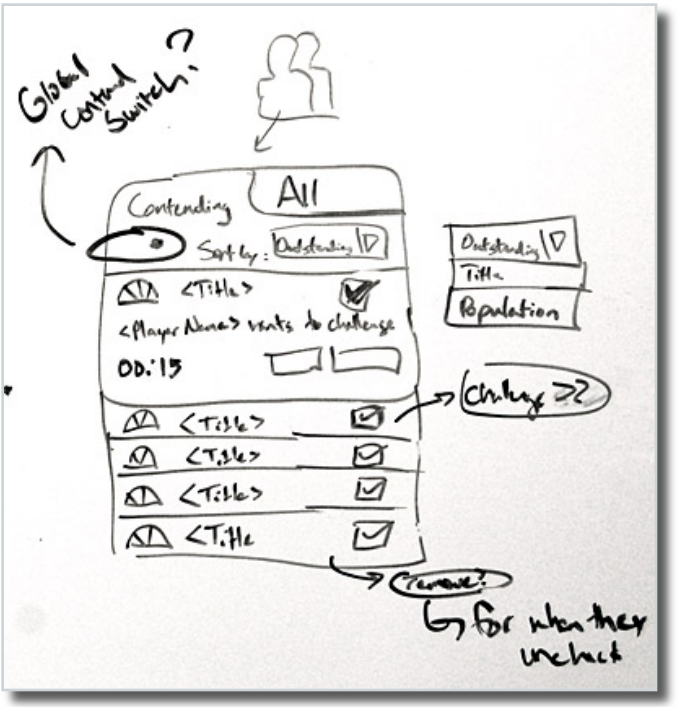
Hobbies:
Painting
Fitness/biking
Taking son Devon to the park

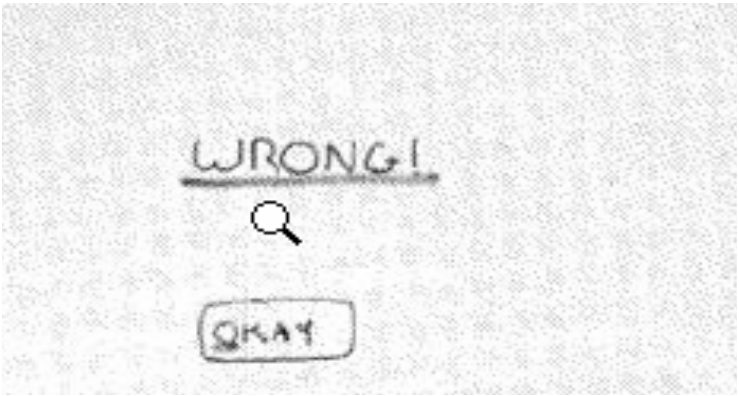
Likes:
Emailing friends & family
Surprises for her husband
Talking on cell phone with friends
Top 40 radio stations
Eating Thai food
Going to sleep late

Dislikes:
Slow service at checkout lines
Smokers

Iterative prototyping is crucial!

High-fidelity, "Wizard of Oz," low-fidelity

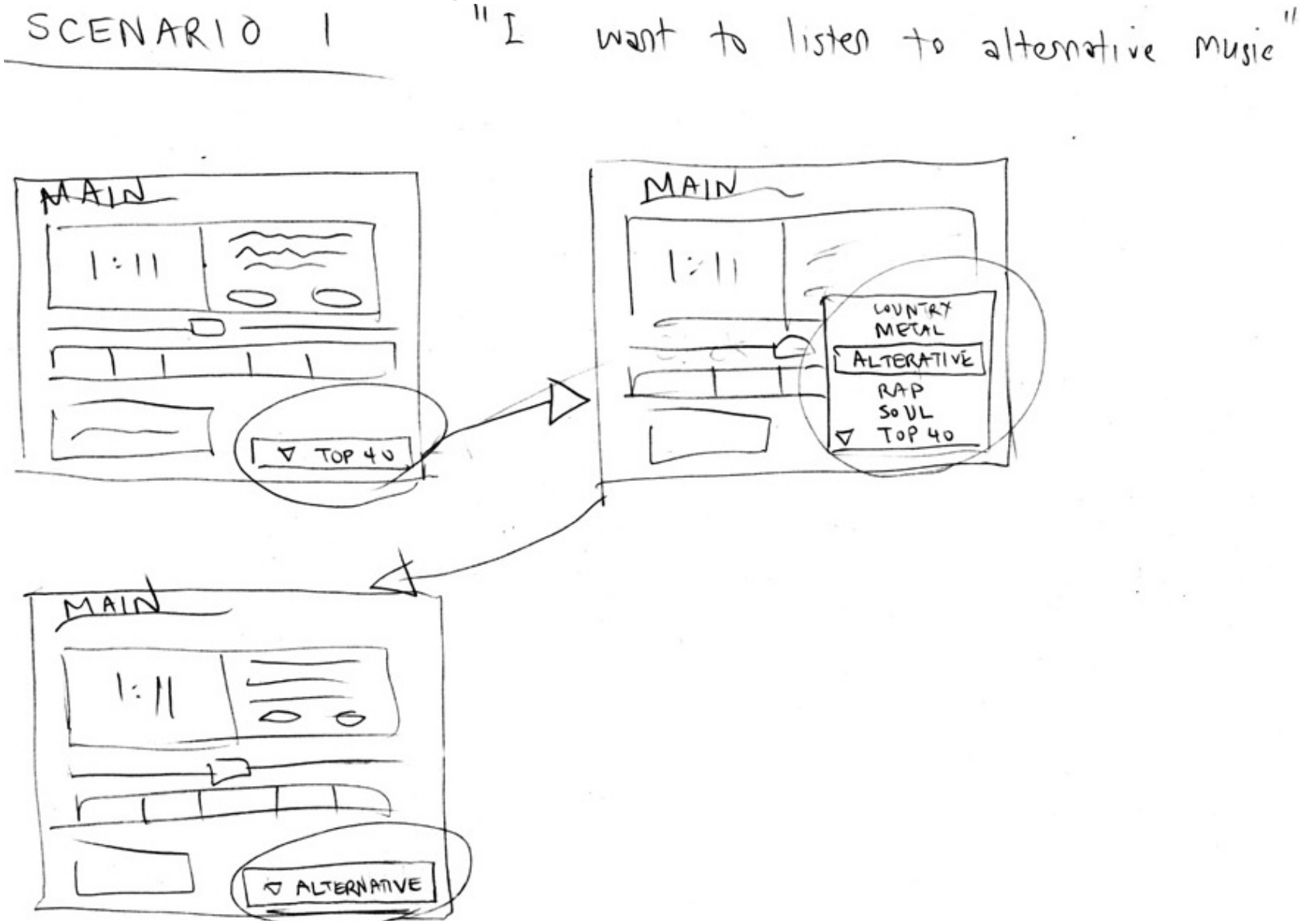




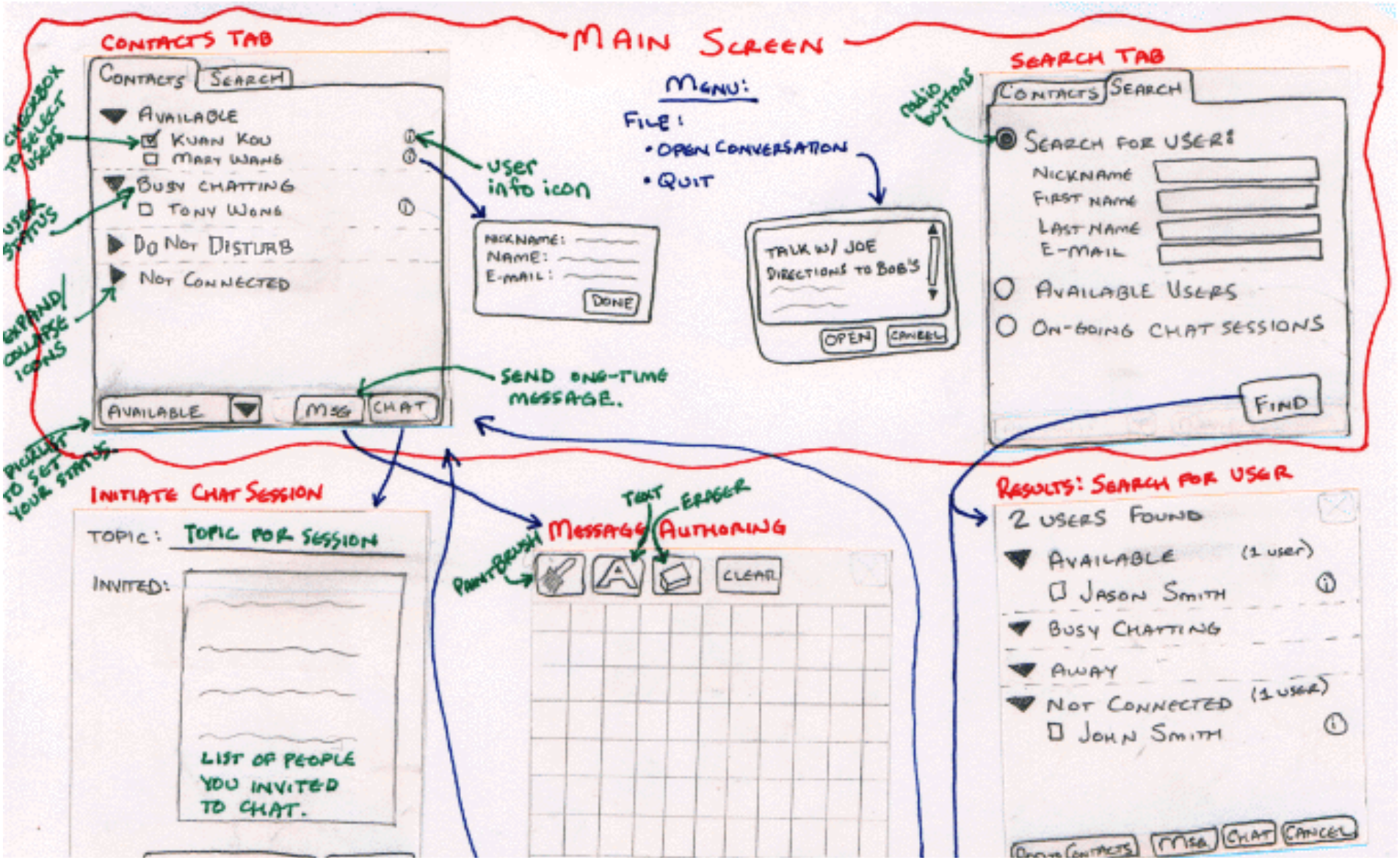
Paper prototypes

- Don’t overthink. Just make it.
- Draw a frame on a piece of paper
- Sketch anything that appears on a card
- Make all menus, etc.
- Redesign based on feedback
- “Think aloud”

Paper prototypes

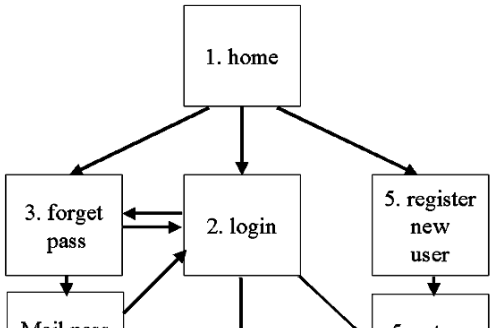


Iterative prototyping is crucial!

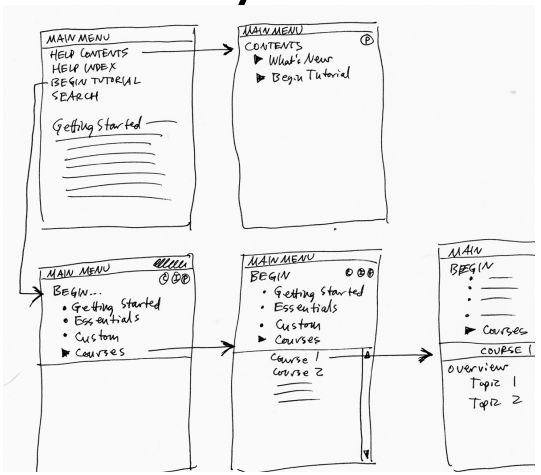


Usability prototyping for websites

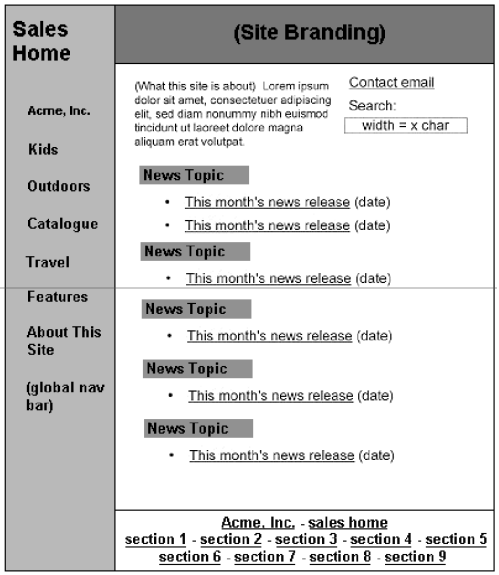
Site Maps



Storyboards



Schematics



Mock-ups

Think aloud example

- Download and install software that lets you encrypt your email
  - "Think aloud" of whatever's on your mind
  - Give them an example

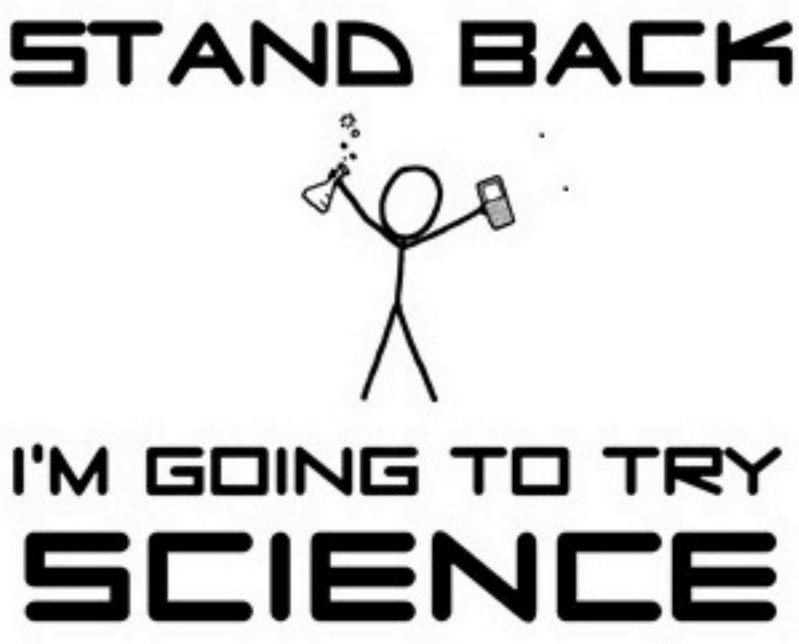
- Additional things you can ask:
  - What are you thinking now?
  - What do you expect to happen if you do X?
  - How did you decide to do that?

Research studies: purpose and goals

- What are you hoping to learn?
- What are your hypotheses?
  - Sometimes listed explicitly in a paper
- What are your metrics for success?
  - More secure, quicker to use, more fun, etc.
- What are you comparing to?
- What data might be helpful?

Broad types of studies

- Descriptive study
- Relational study
- Experimental study



- Formative (initial) vs. summative (validate)

Quantitative vs. Qualitative

- Quantitative: you have numbers (timing data, ratings of awesomeness)
- Qualitative: you have non-numerical data (thoughts, opinions, types of errors)

Types of studies

- What people want/think/do overall:
  - Surveys
  - Interviews
  - Focus groups
- What people want/think in context:
  - Contextual inquiry (interviews)
  - Diary study (prompt people)
  - Observations in the field

Types of studies

- Expert evaluation of usability:
  - Cognitive walkthrough
  - Heuristic evaluation
- Usability test:
  - Laboratory (“think aloud”)
  - Online study
  - Log analysis

Types of studies

- Controlled experiments to test causation
- Varying different conditions
  - Full-factorial design or not
  - Independent and dependent variables
- Many methods apply (e.g., surveys can be designed to test causation)
  - Role-playing studies
  - Field studies

Data to collect during experiments

- Performance (time, success rate, errors)
- Opinions and attitudes
- Actions and decisions
- Audio recording, screen capture, video, mouse movements, keystrokes

Even more data to collect

- Demographics
  - Age, gender, technical background, income, education, occupation, location, disabilities, first language, privacy attitudes, etc.
- Open-ended questions
- Preferences and attitudes

Please respond to the following statements:
**This user interface was difficult to understand*
1- Strongly disagree 2- Disagree 3- Neutral 4- Agree 5- Strongly agree
**This tool was fun to use*
1- Strongly disagree 2- Disagree 3- Neutral 4- Agree 5- Strongly agree

Logistics for a study

- How many participants?
  - Statistical power
  - Time, budget, participants' time
- What kind of participants?
  - Skills, background, interests
  - Their motivations
  - Often not a "representative sample"
- What do you need to build, if anything?
  - Prototype fidelity

Study designs

- Within subjects
  - Every participant tests everything
  - Crucial to randomize order! (learning effect)
  - Fewer participants
- Between subjects
  - Each participant tests 1 version of the system
  - You compare these groups
  - Groups should be similar (verify!)
  - Still randomize!

Validity

- Is this study **ecologically valid**?
  - Does it mirror real-life conditions and context?
- To what degree can we generalize about our results (**externally valid**)?
  - What biases does our sample introduce?

Participants, ethics, and deception

Participants

- Recruit people to do something remotely (e.g., online)
- Recruit people to come to your lab
- Recruit people to let you into their “context”
- Observe people (if possible, get consent! If not possible, consider necessity of design)

Participants

- What recruitment mechanisms?
  - Craigslist, flyers, participant pools, representative sample, standing on street
- How do you compensate them?
  - Ethics of paying $0.00 vs. $10.00 vs. $100,000
- How do you get informed consent?
- What happens to their data?
- Prior knowledge / “what” are they?

Ethics

- How do we protect participants?
  - What risks do we introduce?
- Is there a less invasive method that would give equivalent insight?
- IRB is one arbiter of ethics; experimenters themselves are another crucial arbiter
- How do we make sure participation is voluntary throughout the experiment?

Deception

- Do we mind if participants know precisely what is being studied?
  - Sometimes, it's crucial that we observe their organic responses in context
- What "deception" or "distraction" task can we introduce?
- How do we maintain ethics?
- How do we debrief people at the end?

An entire university's passwords

- 25,000 faculty, staff, students at CMU
- What are their password characteristics?
- How guessable are their passwords?
- How do demographic factors correlate with password strength?
- How do these real passwords compare to leaked / collected passwords?

RISK ASSESSMENT / SECURITY & HACKTIVISM

It's official: Computer scientists pick stronger passwords

Landmark study says people in business school choose weakest passwords.

by **Dan Goodin** - Nov 8 2013, 12:28pm EST

IDENTITY PRIVACY 84

Ethics questions

- How did we get people's passwords?
- How did we obtain consent?
- What ethical concerns are there?
  - What seemed to be done well?
  - What could have been done better?

Social phishing

- Use social networking sites to get information for targeted phishing
  - "In the study described here we simply harvested freely available acquaintance data by crawling social network Web sites."
- "We launched an actual (but harmless) phishing attack targeting college students aged 18–24 years old."

Social phishing

- Control group: message from stranger
- Experimental group: message from a friend
- Used university's sign-on service to verify passwords phished

Ethics

- How did they obtain consent?
- What ethical concerns are there?
  - What seemed to be done well?
  - What could have been done better?
- Who was potentially affected by the study?
- “The number of complaints made to the campus support center was also small (30 complaints, or 1.7% of the participants).”

Institutional Review Board (IRB)

IRB process

- Is it research? Are there human subjects?
- Full review vs. expedited vs. exempt
- Fill out and submit protocol
  - Include all study materials (e.g., surveys)
  - Include recruitment text and/or poster
  - Leave plenty of time