05- Methods and Experiments

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Usable Privacy and Security
Today’s class

• General HCI design methods
• Types of research studies
• Overview of research methods
• Study logistics and validity
• Participant recruitment
• Deception and ethics
HCI Design Methods
Human-Computer Interaction (HCI)

- You are not the user! You know too much!
- Think about the user throughout design
- Involve the user
What is usable?

- Intuitive / obvious
- Efficient
- Learnable
- Memorable
- Few errors
- Not annoying
- Status transparent
Difficulties competing against usability

- 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
Example: personas

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
Example: paper prototypes

• Don’t over think. 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”
Iterative prototyping is crucial!

High-fidelity, “Wizard of Oz,” low-fidelity
Example: low-fidelity paper prototype

SCENARIO 1

"I want to listen to alternative music"
Example: high-fidelity paper prototype
Example: usability prototyping for websites

Site Maps

1. home
2. login
3. forget pass
4. register new user
5. register new user

Storyboards

Mock-ups

Schematics

<table>
<thead>
<tr>
<th>Sales Home</th>
<th>(Site Branding)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acme, Inc.</td>
<td>Contact email</td>
</tr>
<tr>
<td>Kids</td>
<td>Search</td>
</tr>
<tr>
<td>Outdoors</td>
<td>width=x char</td>
</tr>
<tr>
<td>Catalogue</td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Features</th>
<th>About This Site</th>
<th>(global nav bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>News Topic</td>
<td>This month’s news release (date)</td>
<td></td>
</tr>
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Example: think aloud

• 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 and Methods
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 (1)

• 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 (2)

• Expert evaluation of usability:
  – Cognitive walkthrough
  – Heuristic evaluation

• Usability test:
  – Laboratory (“think aloud”)
  – Online study
  – Log analysis
Types of studies (3)

• 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
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!
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
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 (1)

- 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 (2)

• 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?
Institutional Review Board (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
Social phishing (Jagatic et al., 2007)

• 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 (Jagatic et al., 2007)

• Control group: message from stranger
• Experimental group: message from a friend
• Used university’s sign-on service to verify passwords phished
Ethics (Jagatic et al., 2007)

• 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).”