

Lecture 6: Real-World Observations

CS 181W

Fall 2022

Review: Types of studies

- **Interviews:** conversations with individuals
- **Focus groups:** discussions with groups
- **Surveys:** asynchronous questions

- **Experimental Studies:** randomized multi-condition studies
- **Usability Testing:** observations of tool use
- **Cognitive Walkthrough:** expert evaluation

- **Diary Studies:** contemporary record of real-world behavior
- **Observational Studies:** records of behavior in the wild

- Mixed-methods studies

Observe real world activity

observation of
real-world activity

naturally-
occurring risk

Many data collection challenges

Usually not conducive to a controlled
experiment

Events of
interest may be
infrequent



Ways to observe real world activity

- Diaries
- Experience sampling
– real-time surveys
- Ethnographic studies
- Contextual inquiry –
interviewing in context
- Instrumented
software
- Logs (web server,
help desk, etc.)

DIARY STUDIES

Diary Studies

Benefits

- High ecological validity
 - perform task in context of normal activities
 - behave and respond naturally
- Rich longitudinal data

Limitations

- Still self-reported
- A lot of work for participants
- Interesting events may occur rarely

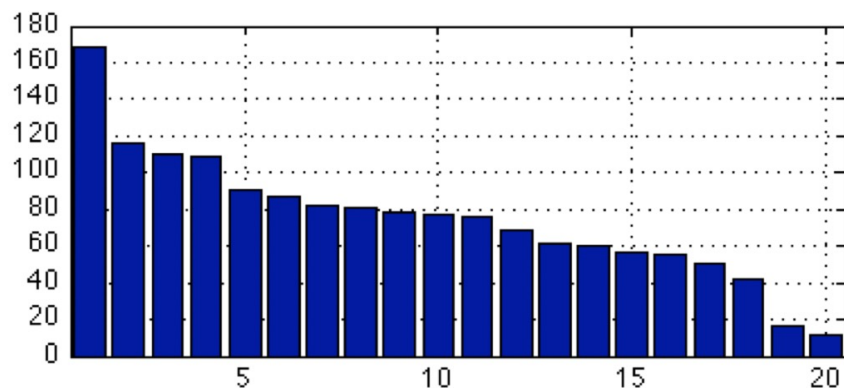
How to do a diary study

- Participants may record words on paper, on a computer, on a mobile device, with camera, with voice recorder
 - Unstructured and open ended, or filling out form
- Various possible frequencies:
 - Once per day diaries ("Every evening, write down the most frustrating thing that happened that day")
 - quick entries throughout the day ("Record every time you log-in to an account")
- Provide clear instructions and expectations
- A lot of work for participants, pay them well

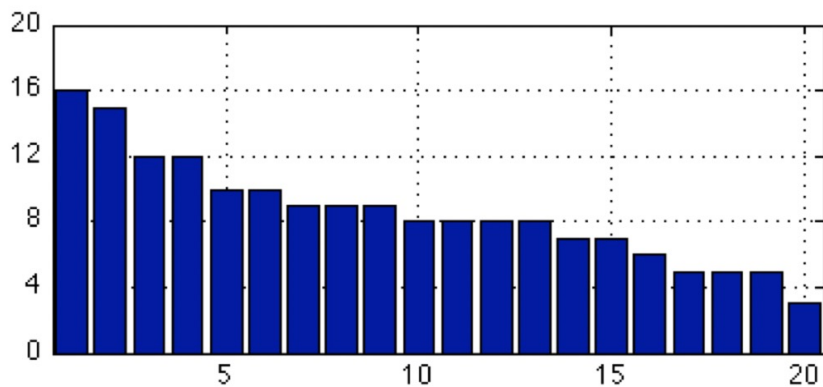
Example: Diary Study

- **Method:** Provided hard-copy diary and asked participants to carry it throughout their day
- **Frequency:** Record each time a password event occurred (type password to login, click to login with saved password, not auto login)
- **Duration:** 2 weeks
- **Study Population:** 20 participants, mostly students

Example: Diary Study



Distribution of Pwd Events



Distribution of Accounts

	Level of Concern					total
	1	2	3	4	5	
none	1	6	22	27	46	60.3%
autofill	2	10	12	5	21	30.0%
writte down	1	0	0	1	5	4.1%
pwd manag	0	0	0	0	0	0.0%
other	1	3	0	2	4	5.9%
total	5	19	34	35	76	

OBSERVATIONAL STUDIES

Observational Studies

Benefits

- High ecological validity
 - perform task in context of normal activities
 - behave and respond naturally
- Rich longitudinal data

Limitations

- People don't like being watched
 - may not agree to participate
 - may change behavior if they feel watched
- Instrumentation / collecting data can be hard
- Interesting events may occur rarely

How to do an observational study

Instrumented Software

- Software that records participants' behavior
- e.g., browser extension, "spyware"

Logs

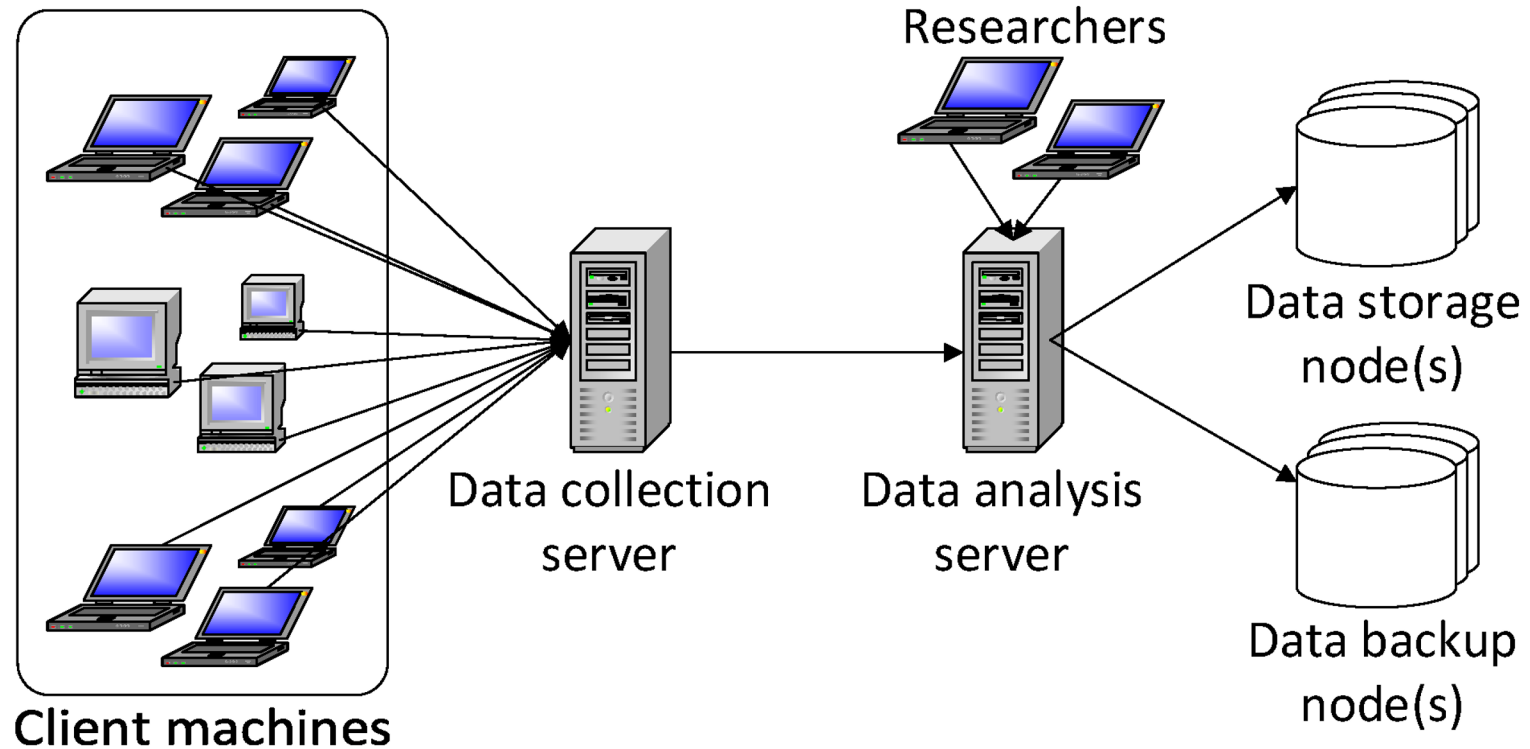
- Log records record behavior by all users
- Can be analyzed
- e.g., server logs, help desk records

Example: Security Behavior Observatory (SBO)

- Network of instrumented home Windows computers
- ~200 active participants
 - Home computer users who have consented to our data collection
 - Own a Windows Vista 7, 8, or 10 personal computer
 - Paid \$10/month plus extra for surveys and interviews
- Natural observation + surveys and interviews



SBO architecture



SBO data related to passwords

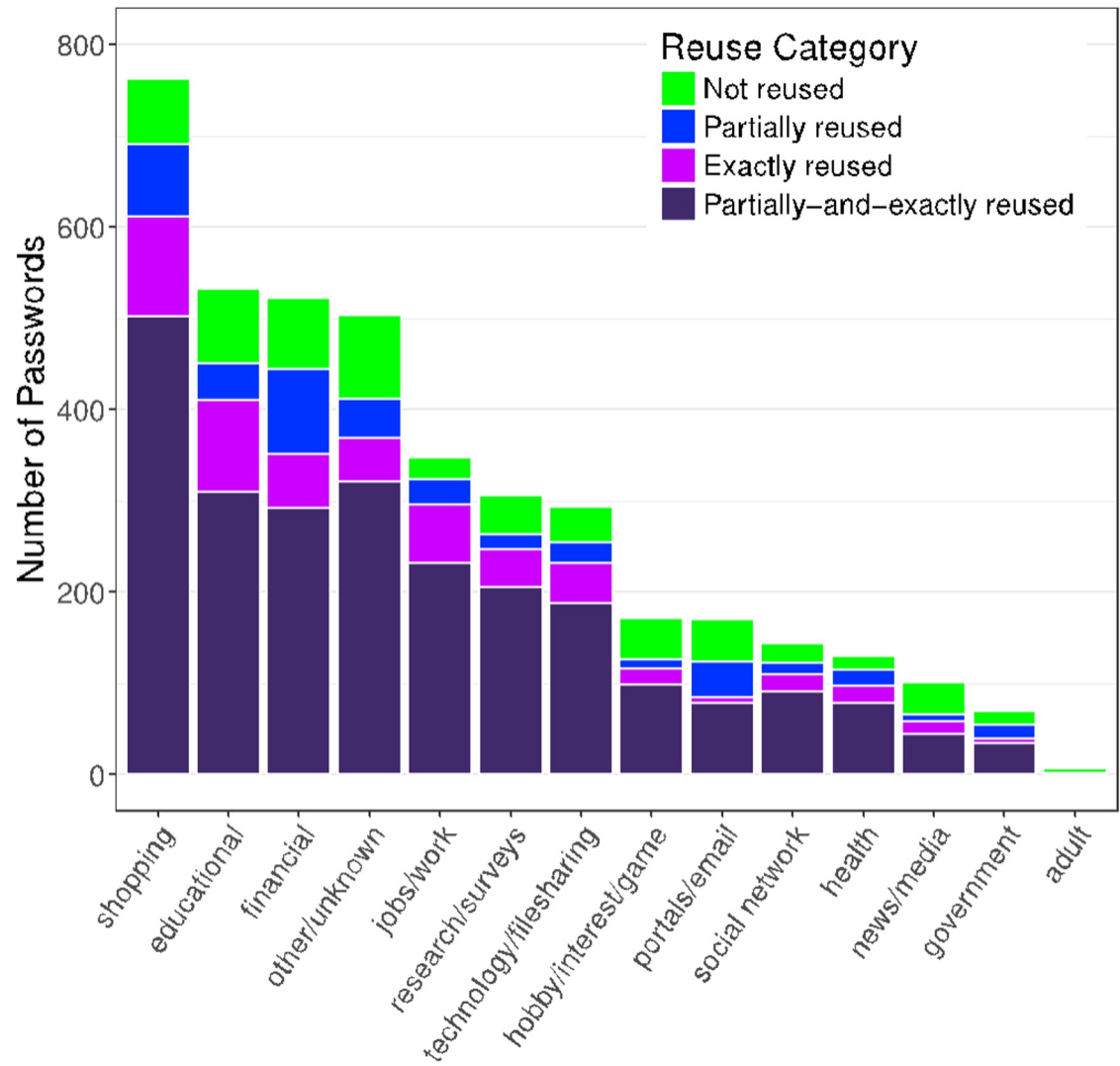
- Hashes of passwords
- Length, strength, characters in each class (upper/lowercase, digits, special characters)

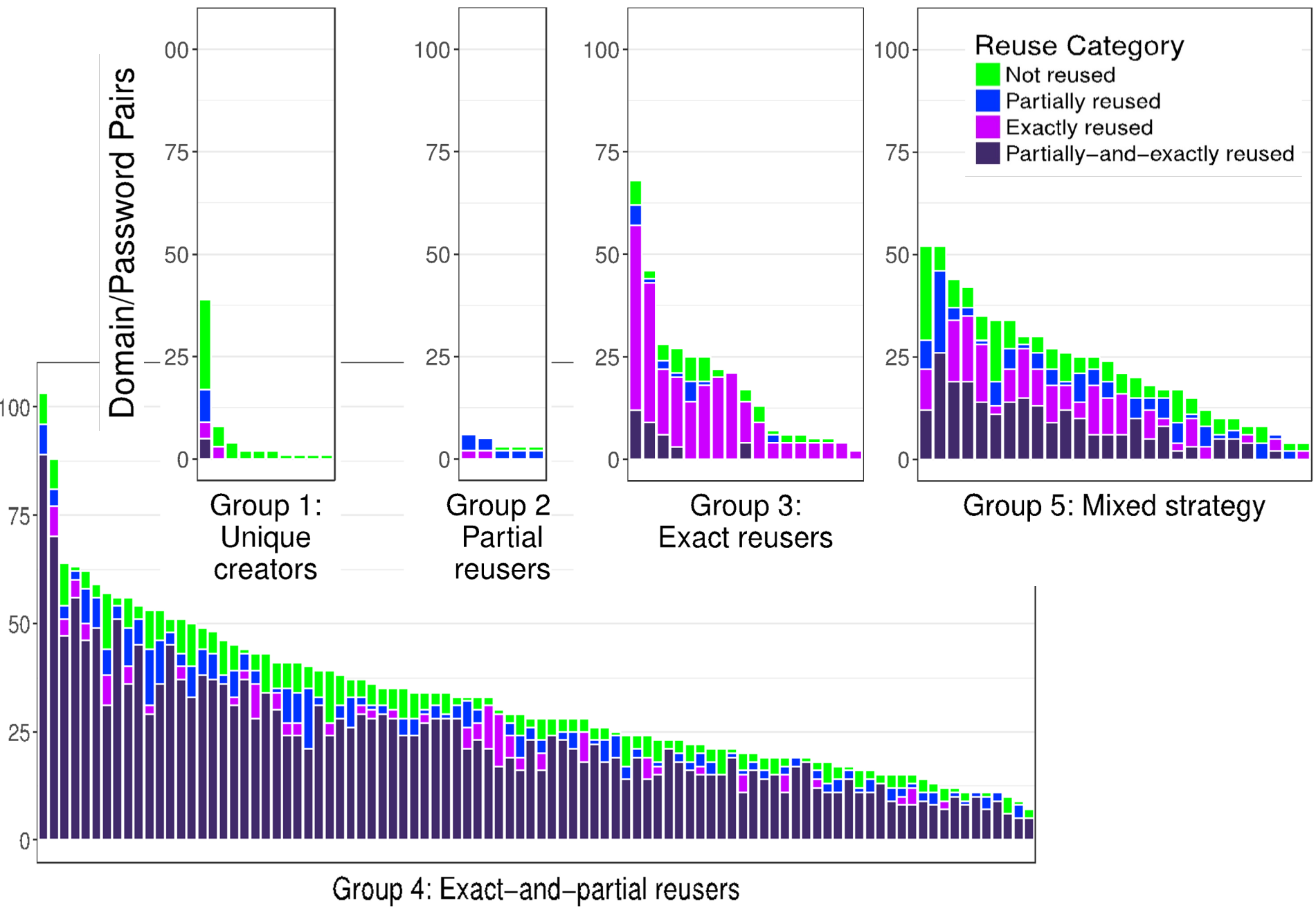


People reuse their passwords a lot

- On average, participants had **26 accounts** with **10 distinct passwords**
- **Percentage of accounts:**
 - With non-reused passwords: 21%
 - With only-exactly-reused passwords: 16%
 - With only-partially-reused passwords: 12%
 - With exactly-and-partially-reused passwords: 51%

Lots of reuse
across almost all
categories of
websites





Worst observed outcome

WV 28

Your personal files are encrypted!



Your private key will be destroyed on:
3/22/2015
Time left: **95:33:14**

Your files have been safely encrypted on this PC: photos, videos, documents, etc. Click "Show encrypted files" Button to view a complete list of encrypted files, and you can personally verify this.

Encryption was produced using a unique public key RSA-2048 generated for this computer. To decrypt files you need to obtain the **private key**.

The only copy of the private key, which will allow you to decrypt your files, is located on a secret server in the Internet; the server will eliminate the key after a time period specified in this window.

Once this has been done, nobody will ever be able to restore files...

In order to decrypt the files press button to open your personal page

and follow the instruction.

in case of "File decryption button" malfunction use one of our gates:



Use your Bitcoin address to enter the site:
1DjStu2m3bvGCixoRboAXX8bJ449LqCpFq

if both button and reserve gate not opening, please follow the steps:
You must install this browser www.torproject.org/projects/torbrowser.html.en
After instalation,run the browser and enter address **34r6hq26q2h4jkzj.onion**
Follow the instruction on the web-site. We remind you that the sooner you do so, the more chances are left to recover the files.

Any attempt to remove or corrupt this software will result in immediate elimination of the private key by the server.

Interview study

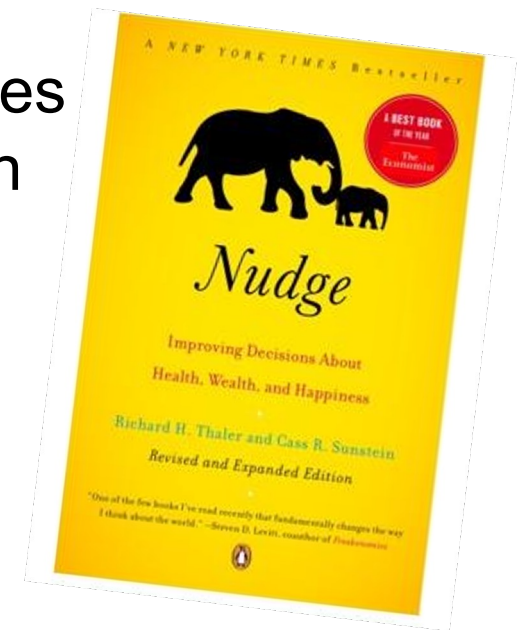
- Contacted 21 participants with evidence of malware or insecure behavior and invited them to 1-hour phone interview
- Conducted interviews with 12 participants
- Topics:
 - **Security engagement** – maintaining computer, updating software, performing independent research before installing new software, etc.
 - **Security state** – presence or absence of anti-virus software, how up-to-date Windows and vulnerable software is, etc.
 - **Security outcomes** – presence or absence of malware or suspicious software

Level of engagement \neq level of security

- Engagement didn't always lead to better security state
 - Some disengaged users had secure computers
 - Some engaged users didn't install security updates
- Good security state didn't always lead to good security outcomes
 - Some very engaged users who maintained good security state still had lots of malware
 - Some disengaged users with poor security state, had little or no malware
- If users have incorrect understanding of security, their efforts may not be effective

Example: CMU privacy nudges project

- Design and test systems that anticipate and exploit cognitive and behavioral biases that hamper privacy and security decision making
- Goals: Help overcome biases without limiting freedom
 - Understand biases
 - Understand problems (regrets)
 - Prototype and evaluate nudges





Just **7 MINUTES OF STAIR CLIMBING** a day has been estimated to decrease the risk of a heart attack by 50% over 10 years.



The **30 MINUTES** of physical activity we need can be accumulated a bit at a time or **ONE STAIRWAY** at a time, spread at intervals throughout the day.

SPEED
LIMIT
25

YOUR SPEED

72

Step 1: A Qualitative Study of Regrets on Facebook

- Semi-structured interviews + diary study
 - 19 FB users recruited from Craigslist
 - 12 interviewees logged daily FB experience for a month
- Online survey
 - 492 US FB users who had regrets recruited from MTurk

What do people regret on FB?

- Posts about
 - Personal information/issues about themselves or others
 - Sex
 - Relationships
 - Profanity
 - Alcohol and drug use
 - Jokes
 - Lies
 - Information about work or company
- Friending and unfriending
- Photo tagging
- Using Facebook applications




Unintended audience

- More than 1/3 regrets involved unintended audience
- 70% unintended audience included Facebook friends (“friends-only” not enough!)
- 10% unintended audience – their Facebook friends showed their posts to others





Underlying cause of regrets

- Didn't mean to
- Not thinking
 - Very excited or angry
- Lack of awareness of how post/tweet will be perceived by others
- Lack of awareness of audience




Timer nudge (stop and think)

 Update Status  Add Photo / Video  Ask Question





heat in the moment|

   Friends ▾ 

You will have 10 seconds to cancel after you post the update




 Update Status  Add Photo / Video  Ask Question

heat in the moment




   Friends ▾ 

Your post will be published in **3 seconds**. [Post Now](#) | [Edit It](#) | [Cancel](#)

Sentiment nudge (how post will be perceived)

 Update Status  Add Photo / Video  Ask Question

I am angry

   Friends ▼ [Post](#)

Other people may perceive your post as **negative**.


Your post will be published in **1 second**. [Post Now](#) | [Edit It](#) | [Cancel](#)

Profile picture nudge (audience feedback)

 Update Status  Add Photo / Video  Ask Question

this is a public post|



 Public ▼

Post



These people and **ANYONE ON THE INTERNET** can see your post.

Step 2: Exploratory study methodology


- Implemented nudges as Chrome plugins + FB app
- Recruited active Facebook users for 3-week study
- Within subjects study
 - ~10 days in control (no nudge)
 - ~10 days in treatment (nudge)
- Collected behavioral data
- Conducted follow-up surveys and interviews
- Payment: \$40 for completion + \$10 for interview
- 21 participants (13 follow-up interview)

Results

- Picture nudge increased awareness of audience
 - Users reported rephrasing/correcting/cancelling posts, changing privacy settings, unfriending
- Timer encouraged participants to stop and think
- Participants didn't like being judged by sentiment nudge
 - Positive sentiment useless
 - Negative sentiment annoyed users
 - Tool not very accurate

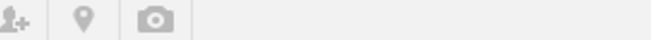
Audience + timer nudge

Passive aggressive people irritate the hell out of me, if you can't say something to my face maybe you should keep your mouth shut.

 Friends **Post**

These people and 102 more can see your post.

Passive aggressive people irritate the hell out of me, if you can't say something to my face maybe you should keep your mouth shut.

 Friends **Post**

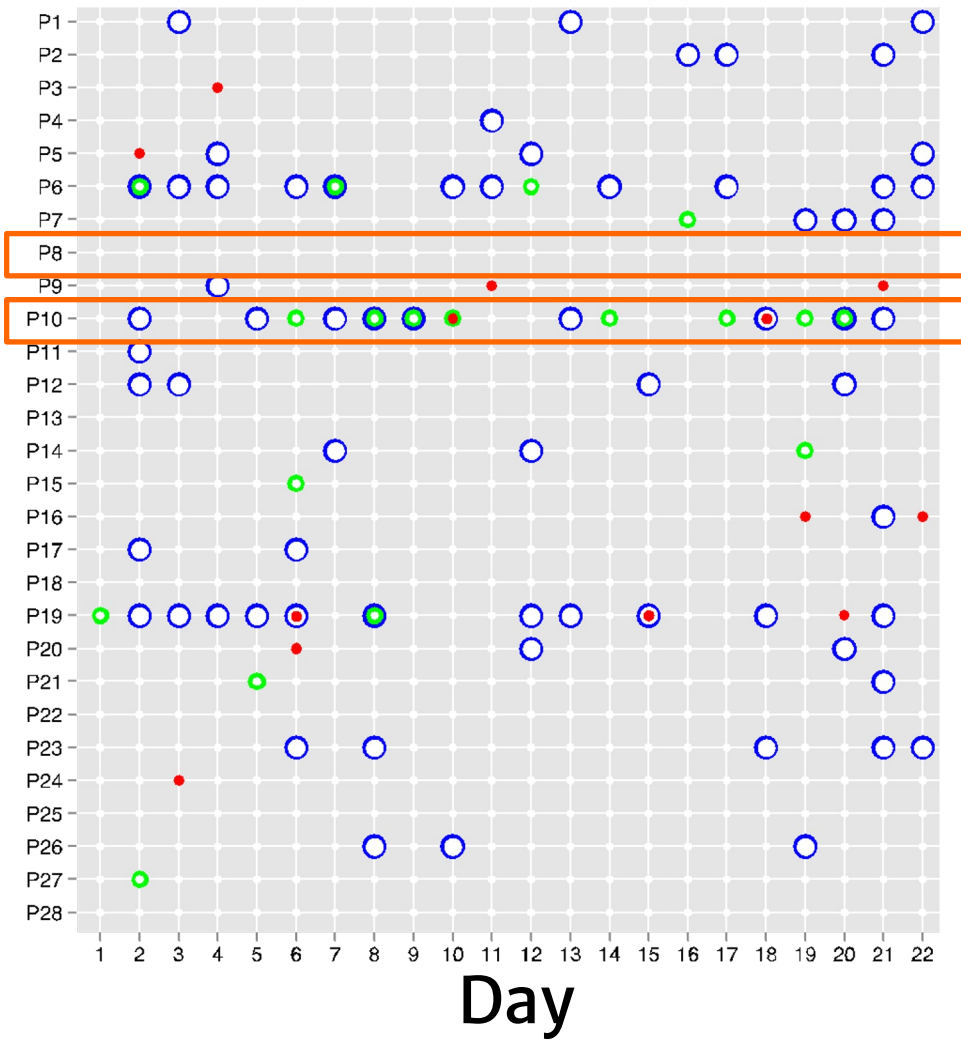
Your post will be published in **3 seconds**.

Post Now **Edit** **Cancel**

Step 3: 6-week observational study

- Conducted during April and May 2013
- Advertised on Craigslist (a dozen large US cities)
- Within-subject design: 1st half, no nudge; 2nd half, nudge
- Mid-term survey and final survey
- 28 participants
- Checked Facebook daily for changes that would break our Chrome plugin or FB app and had developer on standby to fix

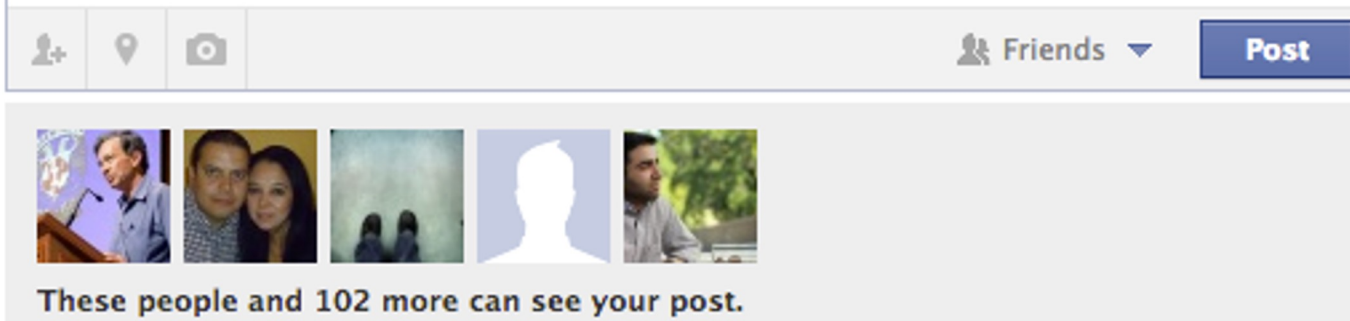
Participant



- click "Edit"
- click "Cancel"
- privacy setting change

Improved awareness

I've been nice up to this point, but the guy has to go!
Eating all the bird seed. Where's my bebe gun?



The image shows a Facebook post interface. At the top, there is a text input field containing the message: "I've been nice up to this point, but the guy has to go! Eating all the bird seed. Where's my bebe gun?". Below the text field is a row of icons for adding people, location, and photos. To the right of these icons is a dropdown menu set to "Friends" and a blue "Post" button. Below the post creation area is a horizontal strip of five profile pictures: a man speaking at a podium, a man and woman, a person in a dark hood, a white silhouette, and a man in a grey shirt. Below this strip, the text reads: "These people and 102 more can see your post."

“It was a snide remark and then one of the pictures that popped up was one of the people I work with. It is probably not the best idea”

Stop and think

not excited about still being sick wtf

Person icon Location icon Camera icon Friends ▾ Post

Your post will be published in 3 seconds.

Post Now Edit **Cancel**

not excited about still being sick after spending all afternoon in bed not doing my paper or having fun.

Person icon Location icon Camera icon Friends ▾ Post

Your post will be published in 3 seconds.

Post Now Edit Cancel

Qualitative Feedback

Positive

- “That was almost the ‘Oh wow’ moment when I realized that more people could see my posts than I thought about”
- “It helped me avoid getting into fights on Facebook because you have to stop and think.”
- “I used it to correct grammatical errors or statuses that looked off.”

Negative

- “I don’t need the full 10 sec delay”
- “there is no way to protect people from posting embarrassing information online while mad or upset...it’s human nature to be stupid sometimes.”
- Technical glitches: e.g., slow performance

Example: Nudging in Cookie Banners



powered by:
Cookie Information

The website uses cookies

This is the cookie banner from Cookie Information.
It collects documentable user consents based on informed
website scans.

Show details

ACCEPT COOKIES

Types of Nudging

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Do you consent to this use? You can find more information in our [Privacy Policy](#).

Accept

Decline

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Do you consent to this use? You can find more information in our [Privacy Policy](#).

Accept

Decline

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Please select which of our partners you allow to use cookies. You can find more information in our [Privacy Policy](#).

- Facebook
- YouTube
- Google Analytics
- Google Fonts
- Ionic
- Google Ads

Submit

[This website] uses cookies to analyze your usage of this site, to embed videos and social media, and to personalize the ads you see. Please select the types of cookies we are allowed to use. You can find more information in our [Privacy Policy](#).

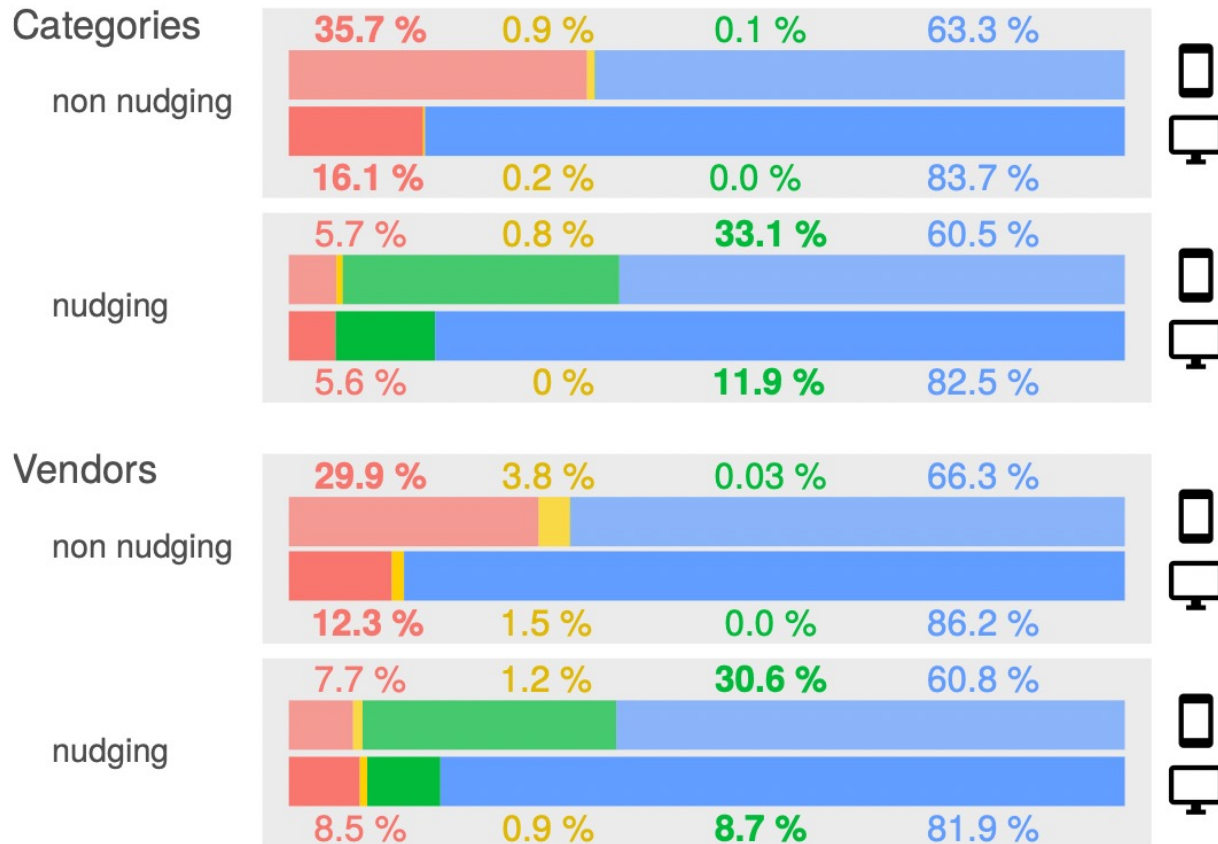
- Necessary
- Personalization & Design
- Analytics
- Social Media
- Marketing

Submit

Experimental Design

- Partnered with German ecommerce website
 - 15-20k visitors/month
 - based on WordPress
- Modified cookie banner plugin to have different conditions and log user behavior
- Notified users of study after 30 seconds

Results



Exercise: Observational Studies

Design an observational study that investigates how people use Duo two-factor authentication at the 5Cs.

A3: Part 1

- Let's do a diary study!
- Record every time you use Duo to log in
 - only counts if you have to approve/do something with Duo
 - Doesn't count if auto logs-in



Real-World Observations

