

17 – Evaluating disclosures

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Usable Privacy and Security

Carnegie
Mellon
University
CyLab

isr institute for
SOFTWARE
RESEARCH

Engineering &
Public Policy



Today's class

- Present Quantified Toilet privacy notices
- Evaluating notice and choice

Progress report presentations

Monday

- Opt-out
- Vitruvians
- Duo Facto

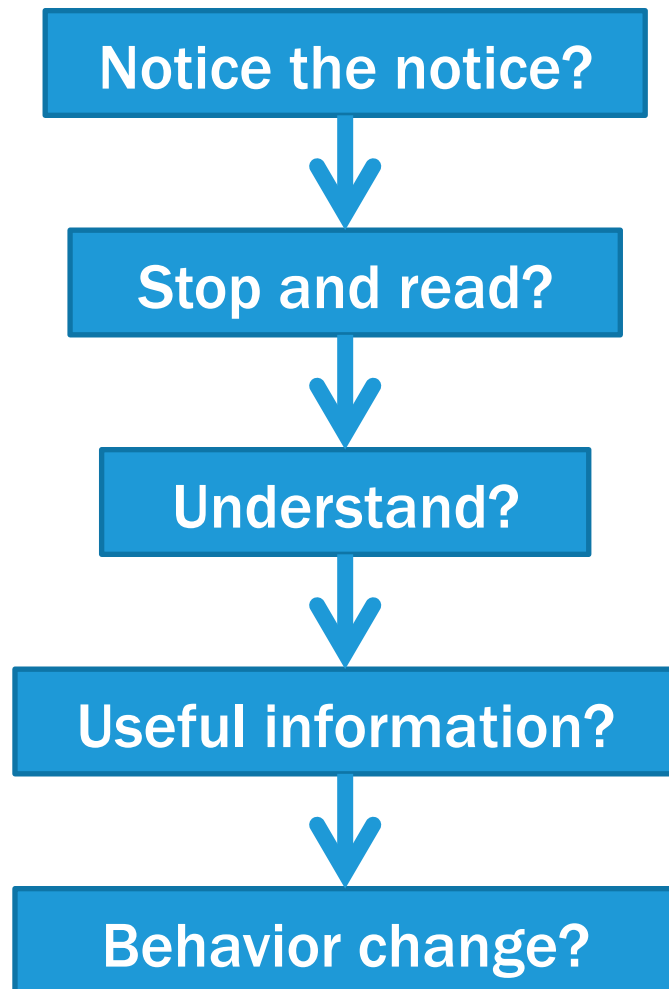
Wednesday

- Aactivists
- Password Protectors
- The Forgotten

Evaluating notice and choice



By what criteria should we measure effectiveness?



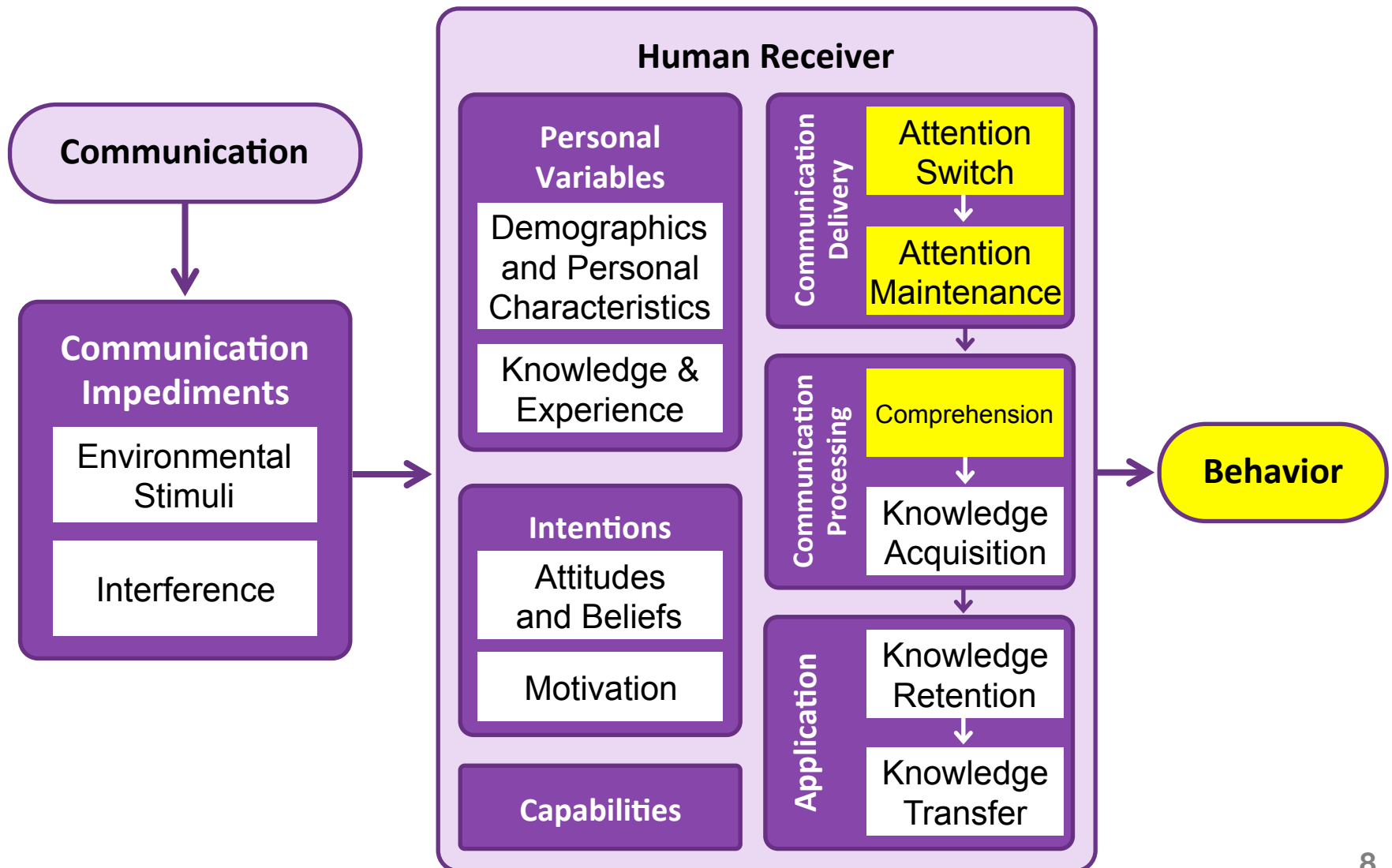
How can we conduct studies to measure notice effectiveness?

- Compare notice versions and no notice
- Ask comprehension and/or policy comparison questions
- Place notice in context of decision-making task
- Use deception so participants don't realize study is about notices or privacy

What should we measure?

- How much time do they spend with notice?
 - More time could mean they find notice engaging, or hard to understand
- Time and accuracy to answer comprehension questions?
- Time and accuracy to compare policies?
- Do they report that this is information they want to know?
- Does information impact decisions or behavior?

Human-in-the-loop framework



Privacy notice evaluation studies

- App notice timing Attention
 - Privacy “Nutrition Labels”
 - AdChoices icon and taglines
 - NTIA app transparency terms
 - Privacy meters in search results
 - App “Privacy Facts”
- Comprehension
- Behavior
-
- The diagram illustrates the relationship between various privacy notice evaluation studies and three key outcomes: Attention, Comprehension, and Behavior. The studies are listed on the left, and the outcomes are shown in blue boxes on the right. Brackets connect the studies to the outcomes: 'App notice timing' is linked to 'Attention'; 'Privacy “Nutrition Labels”', 'AdChoices icon and taglines', and 'NTIA app transparency terms' are grouped by a bracket and linked to 'Comprehension'; 'Privacy meters in search results' and 'App “Privacy Facts”' are grouped by a bracket and linked to 'Behavior'.

App notice timing

Does the timing of an app privacy notice impact the likelihood that people will notice, read, and remember it?

When are app privacy notices most effective?

- In the app store?
- After users download app?
- After users start using app?



R. Balebako, F. Schaub, I. Adjerid, A. Acquisti, L. Cranor. The Impact of Timing on the Salience of Smartphone App Privacy Notices. SPSM 2015.

Web survey and field experiment

- 277 survey participants
 - played virtual app online
 - asked to recall privacy notice minutes later
- 126 field experiment participants
 - downloaded and played app
 - asked to recall privacy notice the next day

App quiz on American inventors

Question 10 of 11



Madame C. J. Walker (1867-1919) was the first African-American female millionaire. Her business included products she invented such as:

bifocals

the parachute

the lightening rod

hair-growing lotion

Oops!! The correct answer is "hair-growing lotion"


NEXT

Notice based on NTIA prototype

US Inventors History Quiz

Privacy Notice


What do we collect?



Browser History

A list of websites visited, or the calls or texts made or received.

Who do we share with?



Ad Networks

Companies that display ads to you through apps.

Participants remembered notices shown during app use

- Notice shown in app store was not significantly different than no notice
- Notice shown in app use had better recall than shown in app store
- Need to place notices where they will be noticed and read
- User studies can inform design



Privacy “Nutrition Labels”



What notice design is most effective?

Can people use privacy nutrition labels to find information and compare policies quickly and accurately?

Iterative design process

- Focus groups
- Lab studies
- Online studies

Privacy Facts
What does ACME Corporation do with Your Personal Information?

WHAT information do they collect?

Information about your interactions with this site including information about your computer or device you visited on this website

Your social and economic categories or group memberships

Your contact information (optional) including your email address and your phone number

Financial or purchase information

HOW do they use your information?

For everyday business purposes: to process your transactions, administer our site, or customize our site for you

For marketing purposes: to notify you about products and services to you that are of interest to you

For profiling purposes: to analyze and use your data, both linked and not linked to you

WHO may your information be shared with?

Our company and companies who help us. Companies who have similar products to ours.

CONTACT US Call 1-800-888-8888 or go to www.acme.com/privacy

eBay Privacy Policy

What we collect: Contact information, Content, Cookies, Demographic information, Social security no. and gov't ID, Preferences, Purchase and financial data, Web browsing information, Unique identifiers

How we use your information: Provide service and maintain site, Research and development, Marketing, Telemarketing, Profiling not based on you linked to you, Profiling based on you linked to you, Other companies

Who is info: You, Other companies

Understanding this privacy report: Data is collected and used in this way. Your data will not be used in this way unless you opt out or in opt-out of some uses of this data.

The Acme Policy

how we use your information

types of information	provide service & maintain site	research & development	marketing	telemarketing	profiling
contact information	!	!	OUT	OUT	!
cookies	!	!	OUT	OUT	!
demographic information	!	!	OUT	OUT	!
financial information	!	!	OUT	OUT	!
health information	!	!	OUT	OUT	!
preferences	!	!	OUT	OUT	!
purchasing information	!	!	OUT	OUT	!
social security number & gov't ID	!	!	OUT	OUT	!
your activity on this site	!	!	OUT	OUT	!
your location	!	!	OUT	OUT	!

understanding this privacy policy: we will use your information in this way. we will not collect or we will not use your information in this way. we will use your information in this way unless you opt out. we will not use your information in this way unless you opt in.

contact us: call 1-800-888-8888, www.acme.com

Acme

information we collect: contact information, cookies, demographic information, financial information, health information, preferences, purchasing information, social security number & gov't ID, your activity on this site, your location

ways we use your information: provide service and maintain site, marketing, telemarketing, profiling, other companies, public forums

information sharing: provide service and maintain site, marketing, telemarketing, profiling, other companies, public forums

Access to your information: This site gives you access to your contact data and some of its other data identified with you.

How to resolve privacy-related disputes with this site: Please email our customer service department.

Acme.com: 5000 Forbes Avenue, Pittsburgh, PA 15213 United States, Phone: 800-555-5555, help@acme.com

we will collect and use your information in this way. by default, we will collect and use your information in this way unless you tell us not to by opting out. we will not collect and use your information in this way. by default, we will not collect and use your information in this way unless you allow us to by opting in.

<http://cups.cs.cmu.edu/privacyLabel>

P.G. Kelley, L.J. Cesca, J. Bresee, and L.F. Cranor. Standardizing Privacy Notices: An Online Study of the Nutrition Label Approach. CHI2010.

Long and short versions

Acme

information we collect

ways we use your information

information sharing

	provide service and maintain site	marketing	telemarketing	profiling	other companies	public forums
contact information		opt out	opt out			
cookies						
demographic information		opt out	opt out			
financial information						
health information						
preferences		opt out	opt out			
purchasing information		opt out	opt out			
social security number & govt ID						
your activity on this site		opt out	opt out			
your location						

Access to your information

This site gives you access to your contact data and some of its other data identified with you

How to resolve privacy-related disputes with this site
Please email our customer service department

acme.com
5000 Forbes Avenue
Pittsburgh, PA 15213 United States
Phone: 800-555-5555
help@acme.com

Acme

information we collect

ways we use your information

information sharing

	provide service and maintain site	marketing	telemarketing	profiling	other companies	public forums
contact information		opt out	opt out			
cookies						
demographic information		opt out	opt out			
preferences		opt out	opt out			
purchasing information		opt out	opt out			
your activity on this site		opt out	opt out			

Information not collected or used by this site: social security number & government ID, financial, health, location.

Access to your information

This site gives you access to your contact data and some of its other data identified with you

How to resolve privacy-related disputes with this site
Please email our customer service department

acme.com
5000 Forbes Avenue
Pittsburgh, PA 15213 United States
Phone: 800-555-5555
help@acme.com

Short Standardized Text

Acme

Acme will collect your contact information. They will use this information for providing you service and maintaining the site and profiling. They will also use this information for marketing and telemarketing unless you opt out. They will share this information with other companies unless you opt out. They will share this information on public forums if you opt in.

Acme will collect your activity on this site, demographic information, your health information, and cookie information. They will use this information for providing you service and maintaining the site and profiling. They will also use this information for marketing and telemarketing unless you opt out. They will not share this information.

Acme will collect your preferences and your purchase information. They will use this information for providing you service and maintaining the site and profiling. They will also use this information for marketing and telemarketing unless you opt out. They will share this information on public forums if you opt in.

Information not collected or used by this site:
financial, SSN or government ID, and location.

Access to your information

This site gives you access to your contact data and some of its other data identified with you

How to resolve privacy-related disputes with this site
Please email our customer service department

acme.com

5000 Forbes Avenue
Pittsburgh, PA 15213 United States
Phone: 800-555-5555
help@acme.com

Online study

- 763 participants, recruited through Amazon's Mechanical Turk
- Between subjects design
 - Standardized label
 - Standardized short label
 - Standardized short text
 - Full text
 - Layered text
- Measured time, accuracy, and enjoyability on information finding and comparison tasks



Effectiveness of AdChoices icon and taglines

Do people know what the icon/tagline mean?

Do people know what would happen if they clicked on the icon?

AdChoices icon study



- 1,505 participants
- Recruited through Amazon Mechanical Turk
- Between subjects online survey



Why did I get this ad?



The New York Times

Tuesday, October 25, 2011 Last Update: 11:21 PM ET

Why did I get this ad?



Search

CLICK HERE

Follow Us Subscribe to Home Delivery Personalize Your Weather

Switch to
Global Edition

JOBS
REAL ESTATE
AUTOS
ALL CLASSIFIEDS

WORLD
U.S.
POLITICS
NEW YORK
BUSINESS
DEALBOOK
TECHNOLOGY
SPORTS
SCIENCE
HEALTH
OPINION
ARTS
Books
Movies
Music
Television
Theater
STYLE
Dining & Wine
Fashion & Style
Home & Garden
Weddings/

Europe Faces New Hurdles in Crisis Over Debt

By STEVEN ERLANGER and RACHEL DONADIO 20 minutes ago

On the eve of a European Union summit meeting, crucial financial measures were still unresolved.

• Tempers Flare as European Meeting Nears

I.B.M. Names Virginia Rometty as New Chief Executive

By STEVE LOHR 22 minutes ago

The selection of Ms.

Rometty, a senior vice president at I.B.M., will make her one of the highest-profile women executives in corporate America.



Archive Offers

THE WORLD SERIES



Dilip Vishwanath for The New York Times

Baseball's Game of Telephone

By PAT BORZI 3 minutes ago

Monday night's bullpen debacle by the Cardinals has put a new spotlight on baseball's reliance on landlines.

New Poll Finds a Deep Distrust of Government

By JEFF ZELENY and MEGAN THEE-BRENAN 3 minutes ago

With Election Day just over a year away, a deep

OPINION »

OP-ED | CLIFFORD WINSTON Are Law Schools and Bar Exams Necessary?

The barriers to entry for the legal industry exist to protect lawyers from competition with non-lawyers.

- Brooks: The Fighter Fallacy | Comments
- Nocera: Jobs's Biographer
- Cohen: Defending the E.U.
- Bruni: Have Glock
- Editorial: Refinancing
- Room for Debate: Will Amazon Kill Off Publishers?

Why did I get this ad?



Varied icon and taglines



- Why did I get this ad?
- Interest based ads
- AdChoices
- Sponsor ads
- Learn about your ad choices
- Configure ad preferences
- 'No tagline'

What people think happens if they click



- 56%** More ads will pop up
- 45%** Will take you to a page where you can buy advertisements on this website
- 27%** Will take you to a page where you can opt out of tailored ads

% who agreed with each statement; some participants agreed with multiple statements

What people think happens if they click

Configure Ad Preferences

~~AdChoices~~



42%

~~56%~~

More ads will pop up

15%

~~45%~~

Will take you to a page where you can buy advertisements on this website

50%

~~27%~~

Will take you to a page where you can opt out of tailored ads

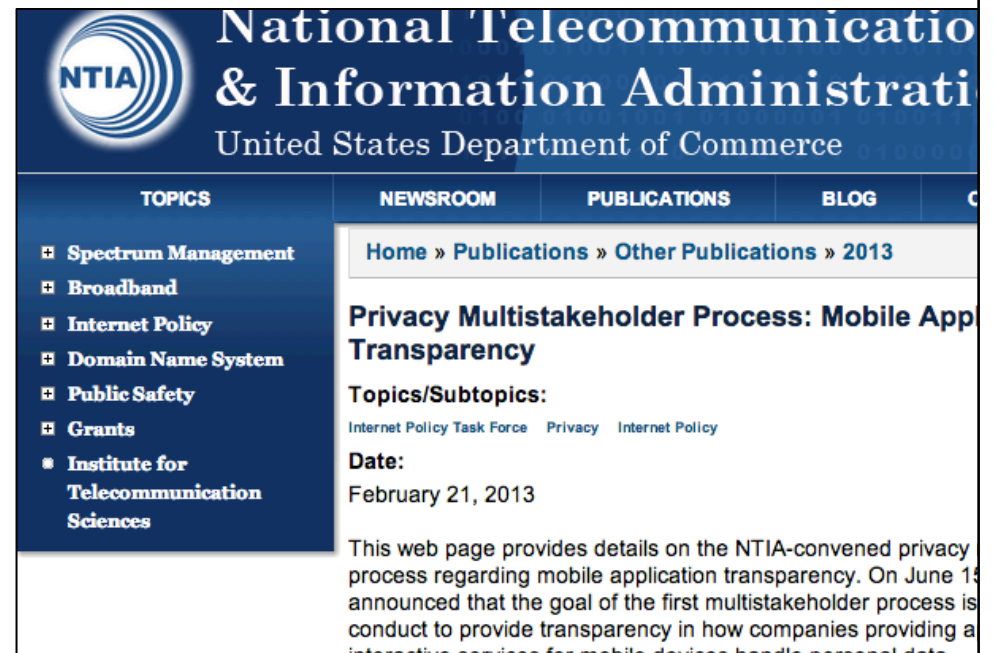
% who agreed with each statement; some participants agreed with multiple statements

NTIA app transparency terminology

Can people match terminology in guidelines to types of data and recipients described by apps?

NTIA Code of conduct for app transparency

- Developed through one-year multistakeholder process
- Goal: Short-form standardized privacy notice for apps
- Notice includes
 - 7 data types
 - 8 third-party entities
- User testing not part of the process



Data Types

- Biometrics
- Browser History and Phone or Text Log
- Contacts
- Financial Information
- Health, Medical or Therapy Information
- Location
- User Files



Data Types

- **Biometrics** (information about your body, including fingerprints, facial recognition, signatures and/or voice print.)
- **Browser History and Phone or Text Log** (A list of websites visited, or the calls or texts made or received.)
- **Contacts** (including list of contacts, social networking connections or their phone numbers, postal, email and text addresses.)
- **Financial Information** (Includes credit, bank and consumer-specific financial information such as transaction data.)
- **Health, Medical or Therapy Information** (including health claims and information used to measure health or wellness.)
- **Location** (precise past or current location and history of where a user has gone.)
- **User Files** (files stored on the device that contain your content, such as calendar, photos, text, or video.)

Data Types

- **Biometrics** (information about your body, including fingerprints, facial recognition, signatures and/or voice print.)

Is your inseam a biometric?

Carnegie Mellon study

- Quick study to inform NTIA MSHP
- 791 participants recruited online (cost \$913.35)
- 4 experts from NTIA MSHP
- 10 app scenarios
- Users read each scenario and tried to determine which data types and entities were described
- 2 conditions – with and without parentheses

R. Balebako, R. Shay, L. Cranor. Is Your Inseam a Biometric? A Case Study on the Role of Usability Studies in Developing Public Policy. USEC 2014.

Scenario example

The SuperTax app lets you fill out and submit your tax forms quickly and easily.

SuperTax will take a picture of your W-2. It will answer questions about your financial information, including salary and interest income.

It will then submit your return to state and federal agencies.

The scenarios describe the data collection and sharing completely, so **you do not need to guess anything outside of what is described.**

16. For each data collected by the app, what type of data is it?

	Biometrics	Browser History and Phone or Text Log	Contacts	Financial Information	Health, Medical or Therapy Information	Location	User Files	None of the Above	Not Sure
Photo of W-2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Salary	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interest Income	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Results

- All 4 experts agreed less than half the time
 - So unclear which answers are correct
- High agreement (>60% agreement) among online participants occurred less than half the time
- Parentheticals helped some, but some definitions were confusing
- Little evidence that these categories and definitions are well understood by users or experts

Effectiveness of privacy meters in search results

Do meters change purchase behavior?

PrivacyFinder Search for: merrell primo chill slide


http://www.privacyfinder.org/?q=merrell+primo+chill+slide nutrition label

merrell primo chill slide Search

Search Engine: ☐ Google ☐ Yahoo! ☒ Shopping Preference Level: Medium


Merrell Primo Chill Slide - Men's Tan: Merrell Shoes

Buy Merrell Primo Chill Slide - Men's Tan and find Spring trends at Onlineshoes. Free Shipping and Exchanges on all Merrell!...
<http://yhs.trafficdashboard.com/track.htm?pid=1031...> - [Privacy Policy](#) - [Similar Pages](#)

 \$89.95


merrell" Primo Chill Slide Shoes, Chocolate, Women's

Italian styled winter slide for convenience and warmth. Easy-on and water resistant, the Primo Chill gives your feet after-sport comfort in casual style. Water-resistant pigskin leather upper with sheepskin lining. Removable wool fleece footbed. Injection-molded nylon shank for increased arch support. Air Cushion EVA midsole for softer flex and increased comfort. Merrell Pilot sole with sticky rubber sports a weight-saving design that is siped and barred for traction....
<http://clickserve.cc-dt.com/link/ddiprod?lid=41000...> - [Privacy Policy](#) - [Similar Pages](#)

 \$90.00


Merrell Primo Chill Slide

We heated up our stylish Italian standout slide with a sheepskin lining with removable footbed and a water resistant pigskin upper. Merrell Pilot Sole has a weight-saving cutaway configuration but is boldly siped and barred for wet and dry surface traction. Slip Lasted Construction. Water Resistant Pigskin Upper. Sheepskin Lining. Wool Fleece Footbed. Nylon 6. 6 Injection Molded Arch Shank. Compression Molded EVA Footframe. Air Cushion Midsole. Merrell Pilot Sole/Sticky Rubber....
<http://shopping.yahoo.com/p:Merrell%20Primo%20Chil...> - [Privacy Policy](#) - [Similar Pages](#)

 \$89.95 - \$89.95

Merrell Primo Chill Slide (Men's)

We heated up our stylish Italian standout slide with a sheepskin lining with removable footbed and water resistant pigskin upper. Merrell Pilot Sole has a weight--saving cutaway configuration but is boldly siped and barred for wet and dry surface traction. FEATURES:



How do we test whether privacy meters change behavior?

Hypothetical task

- Search for product
- Which site would you buy from?

Hypothetical

No real privacy tradeoff

Real task

- Search for product
- Make purchase with your credit card

Expensive

Difficult to control

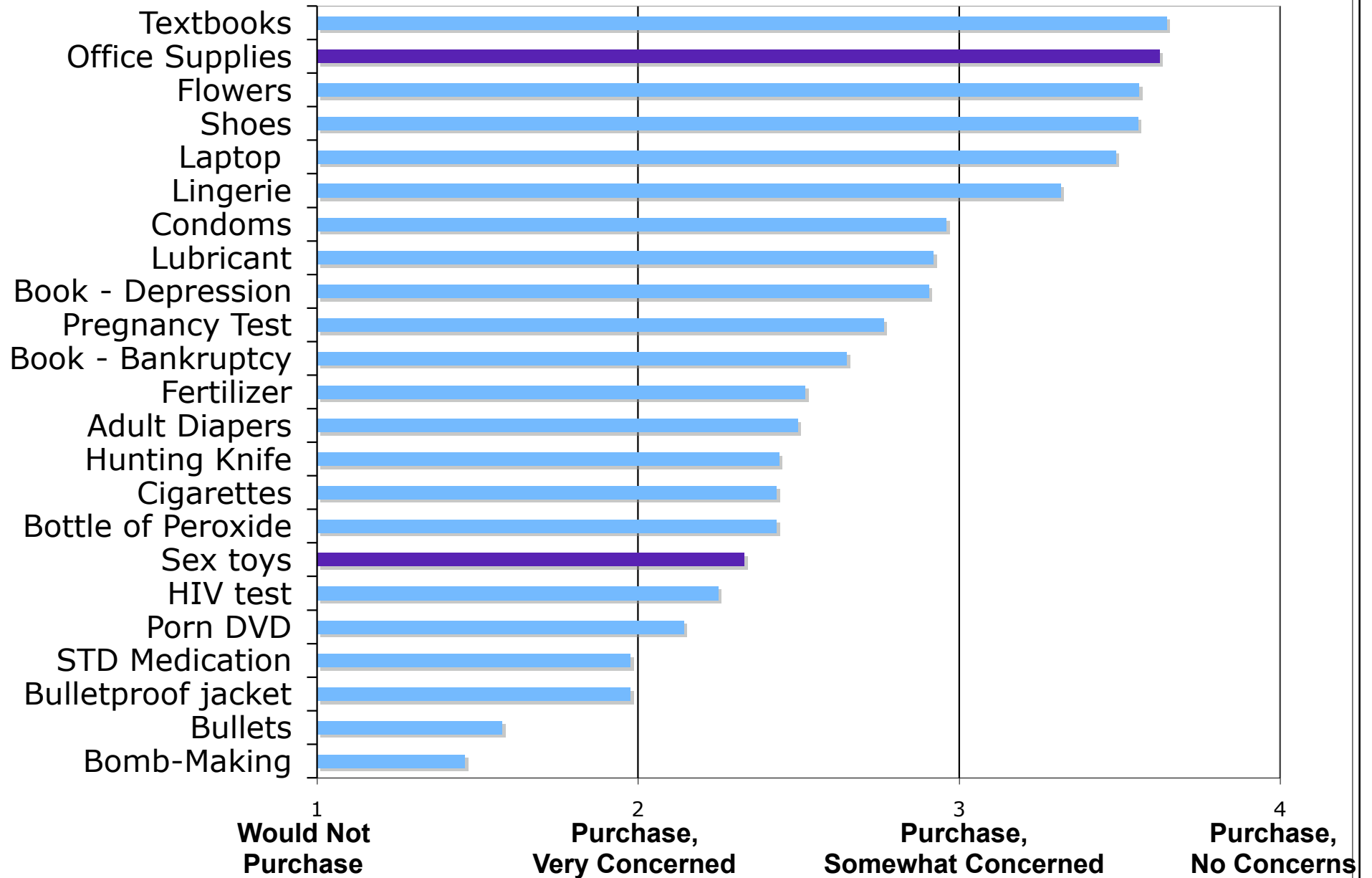
First purchasing study had significant limitations

- Participants were all students
- Reimbursement did not incentivize saving
- Price/privacy tradeoff not obvious
- Maybe people just like pretty indicators
- Privacy-sensitive item not sensitive enough

So we tried again

- 72 Pittsburgh residents
- Price/privacy tradeoff
- Fixed payment, keep the change
- New icons, new products, new conditions

User Study Items





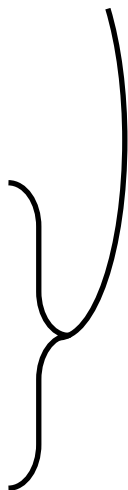
Merchant selection

- Selected 10 merchants for each product
- No well-known merchants
- Controlled first four search results:
more expensive → better privacy


\$.69 privacy
premium



Merchant	Privacy score	Price w/ shipping
ccvsoftware.com	?	\$14.45
discountofficeitems.zoovy.com	0/4	\$14.60
instawares.com	2/4	\$14.80
officequarters.com	4/4	\$15.14



Privacy information condition



□□□□
[Privacy Report](#)

■ ■ □ □


[Privacy Report](#)


[Duracell Alkaline Battery, AA, 8/PK](#)
Duracell Coppertop Alkaline AA Batteries Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarm, cameras, recorders, radios, CD players
www.ccvsoftware.com/c/product.htm


[Duracell AA8 DURACELL](#)
Duracell AA8 DURACELL Alkaline Battery Value Packs
discountofficeitems.com/product


[Duracell Alkaline Battery Value Packs](#)
Duracell AA8 DURACELL Alkaline Battery Value Packs DURACELL AA ALKALINE BATTERY - 8 PACK Cardboard card for peg hook 8 pack Specifications Weight 0.45 lbs Length 4.5 inches Width 3.75 inches Height 1 inches Manufactures Web site www.duracell...
www.instawares.com/Coppertop-Alkaline-Lithium-Bat... [Privacy Policy](#)

[Duracell Coppertop Alkaline AA Batteries](#)
Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.
www.officequarters.com/product.php/item/DUR-MN1500B8... [Privacy Policy](#)


\$14.45 (w/shipping)



\$14.60 (w/shipping)


\$14.80 (w/shipping)


\$15.14 (w/shipping)

43

Irrelevant information condition

 Duracell AA batteries 8-pack

[Duracell Alkaline Battery, AA, 8/PK](#)
Duracell Coppertop Alkaline AA Batteries provide the best, longest power source. Recommended for use in smoke alarms, cameras, recorders, radios, CD players
www.ccvsoftware.com/c/product.htm

☐☐☐☐
Handicap Accessibility


[Duracell AA8 DURACELL](#)
Duracell AA8 DURACELL Alkaline Batteries
discountofficeitems.com/product


☐☐☐☐
Handicap Accessibility


[Duracell Alkaline Battery](#)
Duracell AA8 DURACELL Alkaline Batteries
Cardboard card for peg hook 8 pack Specifications weight 0.45 lbs Length 4.5 inches Width 3.75 inches Height 1 inches Manufactures Web site www.duracell.com
www.instawares.com/Coppertop-Alkaline-Lithium-Bat...


☐☐☐☐
Handicap Accessibility


[Duracell Coppertop Alkaline AA Batteries](#)
Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.
www.officequarters.com/product.php/item/DUR-MN1500B8...

 \$14.45 (w/shipping)

 \$14.60 (w/shipping)

 \$14.80 (w/shipping)

 \$15.14 (w/shipping)


Handicap Accessibility

No information condition



Duracell Alkaline Battery, AA, 8/PK

Duracell Coppertop Alkaline AA Batteries Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players

www.ccvsoftware.com/c/product.html?record@56119



\$14.45 (w/shipping)

Duracell AA8 DURACELL - Alkaline Batteries Value Packs

Duracell AA8 DURACELL Alkaline Battery Value Packs...

discountofficeitems.zoovy.com/product/DURMN15RT12Z



\$14.60 (w/shipping)

Duracell Alkaline Battery Value Packs

Duracell AA8 DURACELL Alkaline Battery Value Packs DURACELL AA ALKALINE BATTERY - 8 PACK Cardboard card for peg hook 8 pack Specifications Weight 0.45 lbs Length 4.5 inches Width 3.75 inches Height 1 inches Manufactures Web site www.duracell.com

www.instawares.com/Coppertop-Alkaline-Lithium-Bat...



\$14.80 (w/shipping)

Duracell Coppertop Alkaline AA Batteries

Long-life alkaline batteries provide the best, longest power source. Recommended for use in smoke alarms, flashlights, lanterns, calculators, pagers, cameras, recorders, radios, CD players, medical equipment, toys and electronic games. Dependable after seven years of storage.

www.officequarters.com/product.php/item/DUR-MN1500B8...



\$15.14 (w/shipping)

Privacy icons influenced purchases

- **No privacy info:** most people purchased where price was lowest
- **With privacy info:** more people purchased from expensive sites with better privacy
- No clear difference between products
 - Because we didn't control **privacy premium?**

Follow-up study to control privacy premium

- Needed cooperation of vendors
- Contacted 46 battery and sex toy vendors
- Convinced 8 to adjust prices for our study
 - Asked one to lower prices and promised to pay the difference
 - Sent \$140 check to The Dirty Bunny for “research project assistance”



Sure enough...

Privacy-sensitive nature of product impacts willingness to pay a premium for privacy



S. Egelman, J. Tsai, L. Cranor, A. Acquisti. Timing is Everything? The Effects of Timing and Placement of Online Privacy Indicators. CHI 2009.

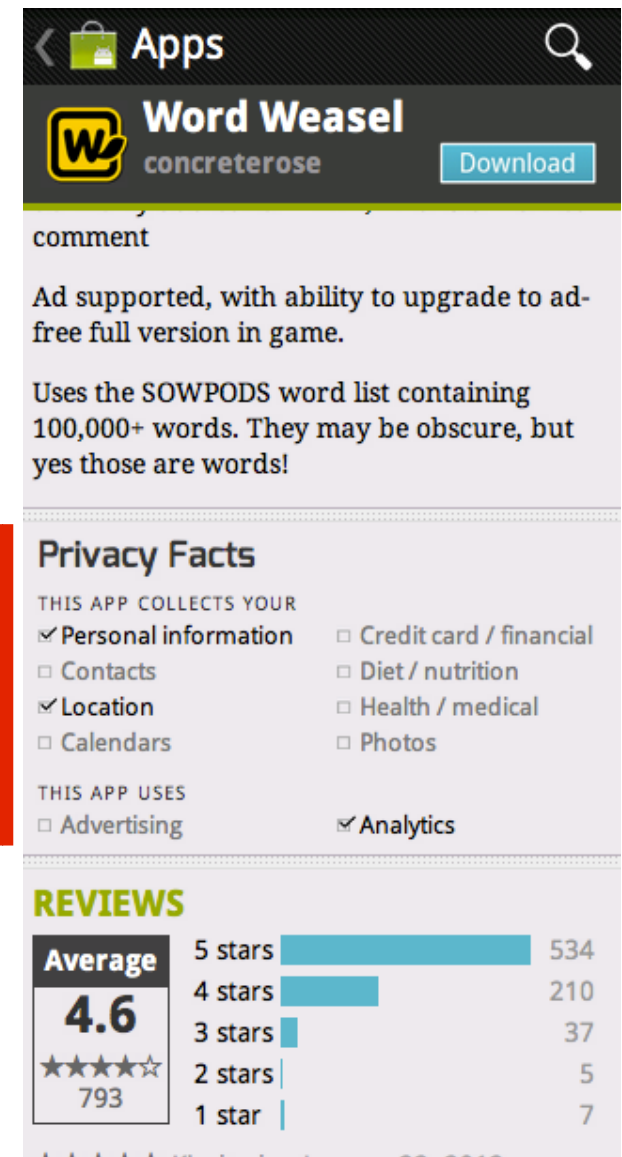
App “Privacy Facts”

Do people notice Privacy Facts in app store?

Do privacy facts influence choices about which apps to download?

Android Privacy Facts

- Task: select apps for friend with smartphone
 - Choose from 2 similar apps w/ different permission requests
- Participants who saw Privacy Facts more likely to select apps with fewer permissions
 - Brand and rating reduce effect





ftc.gov/testingdisclosures

How would you evaluate your
Quantified Toilet notice and choice
designs?